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Electrical Advance for the 1925-6 Season.

SIMULTANEOUSLY with the altering of the clocks to normal time, the electricity supply industry switched over to full-speed activity. The early days of October have witnessed the beginning of a wonderful electrical forward movement which we hope will continue throughout the entire 1925-1926 season.

It is conceivable that there are electrical undertakings in various parts of the kingdom which notice the change-over from summer to autumn without any particular excitement. All experience heavier loads; a few—the small minority we hope—accept such business as comes without enthusiasm; some make seasonal efforts to stimulate the public interest and to satisfy it enterprisingly in their own separate and local ways; while others, availing themselves to the full extent of all the central and local help that is at their command, combine such help in one grand business-promoting campaign in which their public is carried into an electrified atmosphere in an attitude of interested inquiry and investigation.

Seated as we are at the hub of electrical operations, we have the best opportunity for judging things as a whole. What we see at the moment justifies a full measure of optimism with reference to what is going to happen this season. The need for keener commercial development of electricity supply has been recognised during the past few months, and well-thought-out plans have been quietly preparing in many quarters. These have come to fulfilment during the past week or two, and some account of them appears on later pages of this issue. Electrical exhibitions are in progress, as we write, at Nottingham and Leicester; electrical showrooms have been opened at Hackney, Poplar and Swansea; while at Glasgow a Demonstration Hall of the Scottish Electric Lighting Service Bureau was duly inaugurated on Monday.

This is a good beginning, and we believe it establishes a record opening for any electrical season here.

We hope that this burst of activity will set the pace for authorities in all parts of the Kingdom. It augurs well, we feel, for progressive operations on a grand scale during the next six or seven months, and promises big things for the Christmas and New Year peak-load and present period. The electrical retailer and contractor

probably have in mind the fact that the season when the Christmas buyer is making his purchases is only two months away. Notwithstanding adverse conditions, preparations should be made early in anticipation of a good Christmas Electrical trade.

The recent developments to which we refer in this issue are of three kinds, including temporary electrical exhibitions as at Nottingham and Leicester; permanent showrooms as at Hackney, Poplar and Swansea; and a Service Bureau, as at Glasgow. In addition to these, there is the lecture and demonstration work for which E.L.M.A. is lending its powerful and effective aid in some of these and various other places, and above all we have the all-the-time efficient live operations of the British Electrical Development Association, whose series of free public lectures for everybody in any way electrical made a good beginning yesterday.

We need to do everything in reason during the next six months to keep electricity to the fore. If we continue as we have begun, and find the B.E.D.A. in funds to render it equal to the opportunity now presented, it will be easy to understand why some people connected with the gas industry were so annoyed when we recently, quite legitimately and honourably, let their cat out of the bag.

British Electrical Goods are Best.

Currency having recently been given to reports that large purchases of foreign goods were being made by the Post Office, the Postmaster-General has issued a reply which should effectively dispose of the misrepresentations. He has selected four points for the purpose of his reply. It was complained that British makers were being ignored by the use of electrical date-stamping machines of foreign make to impress the words "British goods are best." To this it is replied that, while the machines were made abroad (but use British-cut dies), this was so because no such machines are produced by any British firm, and the home demand is so small that it is unlikely that they ever will be made here. Second, the Post Office was charged with neglecting British telegraph systems in favour of "the French Baudot machines." The reply to this is: During the past fifteen years the Post Office has purchased no foreign-made Baudot instruments except two specimen sets bought in 1922 from the French Government at a cost of £30; furthermore, British telegraphic inventions are widely used in the service. Complaint three was that a large consignment of German telephone switchboards had recently been delivered at the Central Telegraph Office. Here the P.M.G. shows that the statement can only relate to "One specimen set of a new foreign type of telegraph apparatus procured for experimental purposes," and no "live business" (interesting words!) can afford to refrain from constant experimental trials of the latest inventions. The last of the points selected for reply relates to a large order "running into six figures" about to be placed with foreign manufacturers for glass battery jars "with no better reason than a difference in the tint of glass." Here the P.M.G. is justifiably emphatic and describes the report as "wholly untrue." He might have used stronger language in view of the fact that the order referred to is presumed to be one for less than £2,000 which was given to a British firm which will make the jars at its own factory in Yorkshire. "No tender from the Continent was invited or received, and no order for such jars has been, or is about to be, placed abroad.

It is deplorable that such gross misrepresentations should be made, but one can hardly regret that the opportunity has been created for the head of a great public Department, spending many millions a year on manufactured products, to state so clearly its definitely and consistently pursued policy of buying British goods "whenever possible, even though foreign goods may be obtainable at slightly lower prices," in the sincere belief that "British goods are best." It is very satisfactory to learn that more than 99½ per cent. of the Post Office expenditure on electrical apparatus during the last year has been on goods of British manufacture. May this policy long continue! To certain other authorities let us say: "Go thou and do likewise!"

The Postmaster's testimonial to the quality of British electrical products should be given the widest possible publicity. British goods *are* best, and the world should be let to know it by the full force of advertisement as well as by practical observation and experience gained with the product itself.

Trade and Unemployment.

While considering this question of the policy of Government Departments with reference to the need for Home support to be given to British manufacturers, it is worthy of note that the Ministry of Health issued a statement last week stating that the policy set out in the circulars of 1923 and 1925—already discussed in these pages—has not been altered. It is still made a condition of any grant given expressly to assist the relief of unemployment that contracts for or incidental to such works are to be placed in this country. What other course could reasonably be pursued? But the circular went further than that by urging that in view of the industrial situation here, only under very special circumstances should contracts of local authorities for any works whatsoever be placed with other than British concerns. There is no political question involved—it is a sheer necessity arising from our special unemployment circumstances. But there is another aspect of the matter to which the Ministry of Health, with all its good intentions as aforesaid, has paid regard in connection with a war-time resolution passed at Stoke-on-Trent in 1916, when it was resolved that "no contract should be entered into with any person of German or Austrian nationality." That decision was right enough when it was arrived at, for we were fighting for all we were worth with every available weapon; there are still many amongst us who cannot yield to sweet relenting grace and make friends with their former adversaries, but one cannot shut one's eyes to the fact that since 1916 many things have happened which may legitimately soften some of the former asperities. Anyhow, the idea of the present Government appears to be that in view of the Commercial Treaty recently concluded with Germany, the Stoke-on-Trent resolution of 1916 should now be rescinded, because the said Commercial Treaty was based on the principle of treating German citizens, enterprises, and goods no worse than those of other foreign countries. This policy of the Government, however, does not prevent the Premier from urging every member of his Party to make a point of buying British goods. In his speech at Brighton last week he pointed out that a result of our serious unemployment was that we were faced with a growing excess of imports which if continued would be a "real danger to the economic stability of a country which relies on foreign countries and on overseas for the bulk of its food." The purchase of British goods would give an impetus to our trade which would be felt from one end of the country to the other. This was not counsel to discriminate against the people or manufactures of any particular foreign nationality, but to discriminate in favour of British products against all others with a view to cutting out that cankerous, demoralising and costly growth—unemployment.

Electricity Districts: Some Comparative Figures.

An interesting comparison between the various Electricity Districts (especially those delimited) is deducible from one of the tables in the last Generation of Electricity Report of the Electricity Commissioners. This table gives the total energy generated in each area, and thus shows in a general way their relative importance electrically. The London and Home Counties area tops the list with 1,949 million kWh, which is just over a quarter of the total of the entire country. The next in importance is a district not yet delimited, for obvious

reasons, *viz.*, Northumberland and Durham, which generates 1,041 million kWh. After this comes the S.E. Lancashire District with 838 millions. These three areas therefore account for more than half the units for the whole kingdom (*viz.*, 7,415 millions). Following these come the West of Scotland District, 535 millions; West Riding of Yorkshire, 426 millions; and Mersey and West Lancashire, 387 millions. Of the remaining areas, the totals begin to get small, there being only three with over 200 millions, namely, S.W. Midlands, 309 millions; N.E. Midlands, 265 millions; and South Wales, 206 millions. These districts account for about 80 per cent. of the coal consumed in the steam stations of the whole country.

A further point of interest may be deduced from the tables with regard to the efficiency collectively of the stream generating stations grouped under their several areas. As introduction, it may be noted that the average fuel consumption per kWh of the combined stations of the whole kingdom is 2.5 lb. of coal. Taking each area separately, the average figure is sometimes better, sometimes worse. The best area appears to be S.E. Lancashire, where the collective fuel consumption per kWh works out at 2 lb. The West of Scotland and North-East Coast come close with 2.1 lb., and the N.E. Midlands with 2.2 lb. The areas which approximate to the whole country's average of 2.5 lb. of coal are Mersey and West Lancashire, Edinburgh and Lothian, London and Home Counties, and West Riding. Coming to the higher figures, we have South Wales at 2.6 lb. and Mid-Lancashire at 2.8 lb. The areas averaging between 3 lb. and 3½ lb. are Bedford, North Hants and Oxford, N.W. Midlands, Lower Severn, Kent, S.W. Midlands, E. Midlands, and N. Lancashire. The only other district of importance is N. Wales with 5.6 lb. With regard to the N. Wales area it should be explained that only 11 million kWh is generated by steam power but 46 millions by water power.

Broadly, these figures in some measure show the relative scope for economies as between area and area.

The above analysis refers only to steam stations. The remaining units generated by other methods are, however, less than 5 per cent. Of this remainder about half is generated by waste heat. Gas, oil, refuse destructor and water power of small importance relatively make up the balance. Water power does not amount to 1 per cent.; indeed, except for the N. Wales system, the kWh generated by water would be only about 4¼ millions.

Firemen's Risks.

THE accident whereby a London fireman, Sub-Officer Sinden, lost his life through receiving an electric shock in the course of his duty last month, appears to have been unique in the history of the London Fire Brigade—may it so remain! The practice of the Brigade has been to accept the risk, and to take no special precautions when live wires are present—"especially if the wires are only for lighting purposes." It was given in evidence that nearly every man in the Brigade occasionally received shocks, but regarded them as being only disagreeable, not dangerous.

Unfortunately, however, under certain circumstances shocks at pressures below 250 volts, especially if alternating, are unquestionably dangerous to life. The essential factor which appears to attend every case of the kind that we can call to mind is the presence of water, which enables the body to make a low-resistance contact with the earth or one pole of the circuit; that condition satisfied, it only remains for fairly good contact to be made with the other pole. Such accidents therefore usually happen in the bath-room, wash-house, or cellar with a damp floor. In this instance, of course, water was present in abundance; the other condition—contact with a live conductor—was fulfilled by the brass helmet of the fireman touching a "tube containing a live wire." With regard to the latter, Dr. F. J. Waldo, the City Coroner, in his able summing-up to the jury, recalled a fire in 1923 in Redcross Street, which was declared by a jury to be due to a defective electrical installation in slip-socket conduit, and said that "the same bad unsafe system" was in use on this occasion; he described it as "a system condemned in the excellent regulations of the Institution of Electrical Engineers," and said he had suggested the compulsory adoption of those regulations. It is true that "plain slip sockets" do not comply with the regulations, and are very rightly condemned, but unscrewed conduit properly installed with "some form of screwed or grip joint which will give ample and permanent electrical conductivity and mechanical rigidity throughout" is approved. Everything depends upon the honesty and skill of the workman who installs the conduit, but the same can be said of any job that is carried out with earthed metal sheathing, and we should be loath to condemn unscrewed conduit simply because the job can be scamped. The compulsory adoption of the I.E.E. Regulations would not necessarily abolish its use.

As regards the helmet, Dr. Waldo mentioned in his summing-up that "it was made of brass, with loose leather lining strung up inside, and with the one-inch-wide rubber band usually found round the inside rim of the helmets of the London Fire Brigade apparently removed in the present case." Had the rubber band been present, it seems probable that the violence of the shock would have been mitigated and the unfortunate victim might have escaped with a fright. Dr. Waldo raised the question of completely insulating brass helmets, but we doubt the possibility of this. The proper course is to cut off the supply of electricity at the main switch as soon as possible, just as the firemen already make a practice of cutting off the gas. The jury, agreeing that the cause of the fire was unknown, added a rider urging that firemen's helmets should be insulated, surely it is better to remove all possibility of getting a shock than merely to close one of the many possible channels by which it may reach the person.

Charges for Electricity.

AT a meeting of the Corporation of the City of London, on Thursday last week, Mr. Deputy Sandle raised the question of the price of electricity in the City, and secured the appointment of a special committee to consider what further steps could be taken to obtain a cheaper supply. It will be remembered that the matter was under discussion about a year ago, and we are not surprised that it is once more brought up. As Mr. Sandle pointed out, during the past six years the two companies which supply the City have paid dividends aggregating 88 and 89 per cent. respectively, and have put to reserve sums amounting to 91 and 75 per cent. respectively—a total of 179 per cent. on the paid-up ordinary capital in one case, and 164 per cent. in the other.

There can be no question that, whatever was the case in bygone days, some of the London companies have been making large profits since the war. A comparison between the prices charged by the municipal undertakers and the companies in the East London area can leave no doubt in the mind of an impartial observer that the rates charged by the latter are greatly in excess of those offered by the former; moreover, the municipalities show more enterprise, seeking to develop the use of electricity and to serve the public, whereas the companies appear to be content with such load as the public brings to their doors. We are loath to make these admissions, seeing that we have always upheld the advantages of private enterprise, which in other spheres of industry is undoubtedly vastly more efficient than any form of communal management—but the facts admit of no denial.

Under the scheme embodied in the new constitution of the London and Home Counties Electricity District a sliding scale will come into force, and with the fear of 1931 removed the companies may change their policy and show less inertia. We hope so. In the meantime, though Mr. Sandle's references to the prices charged for bulk supply are based on a misapprehension, in the main his statements are accurate, and he has made out a strong case for reform.

Practical Nomography.

How to make and Use Nomograms.

By REGINALD O. KAPP, B.Sc., A.M.I.E.E.

(*Concluded from page 572.*)

In some cases, though rarely, an evenly divided scale is essential, and only obtainable if the chart is of the slanting line form. Fig. 7 is an illustration of such a case.

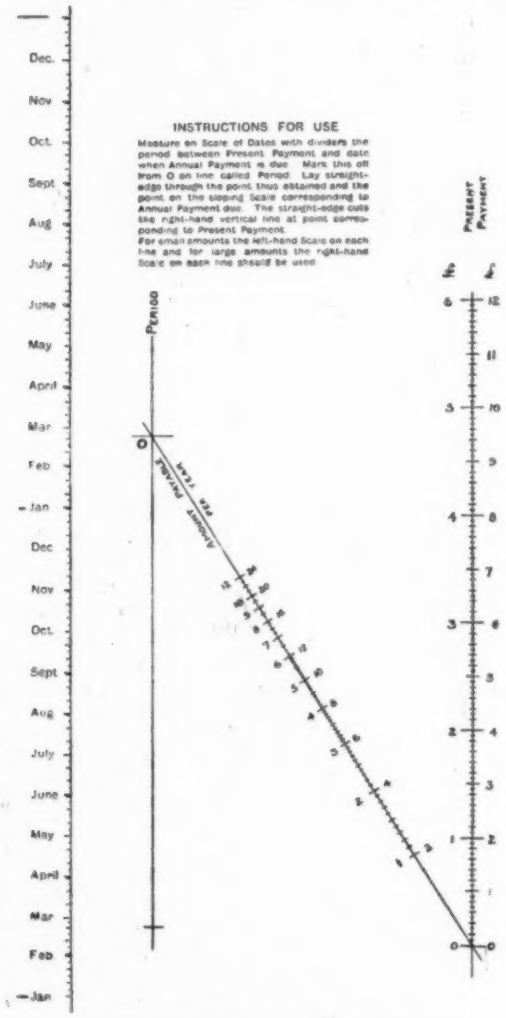

INSTRUCTIONS FOR USE
Measure on Scale of Dates with dividers the period between Present Payment and date when Annual Payment is due. Mark this off from O on line called Period. Lay straight-edge through the point thus obtained and the point on the sloping Scale corresponding to Annual Payment due. The straight-edge cuts the right-hand vertical line at point corresponding to Present Payment.
For small amounts the left-hand Scale on each line and for large amounts the right-hand Scale on each line should be used
Dec.
Nov
Oct.
Sept
Aug
July
June
May
April
Mar
Feb
Jan
PERIOD
PRESENT PAYMENT
£
O

Fig. 7.—Nomogram of Present Values.

Parallel Line Charts with a Grid.

Some formulæ containing four independent variables can be represented by charts without pivot lines so that the ruler need only be laid on the paper once. Two of the variables are represented by intersecting lines forming a co-ordinate system or grid.

As an example, we will consider the well-known chart for finding the efficiency of a transformer at any percentage of full load from the iron and copper losses expressed as a percentage of full load. Let these be Fe and Cu respectively, and the efficiency be η at any proportion β of full load. The iron loss is independent of the load, the copper loss proportional to the square of the load, so that at any proportion of full load

$$\beta\ (100-\eta)=\mathrm{Fe}+\beta^2\ \mathrm{Cu},$$

which assumes the form suitable for parallel straight lines if we write it—

$$\mathrm{Fe}-\beta\ (100-\eta)+\beta^2\ \mathrm{Cu}=0.$$

A chart for this expression is about the most complicated type likely to be met with in practical work. It will be instructive to consider how to make it, but the reader should not allow himself to think it typical of the cases he is likely to meet with. He may skip this section without losing the context of the remainder.

This would give a chart of the parallel straight line type if β were constant. For $\beta=1$ the scales would be identical on the outer A and C lines, and the divisions would be placed at half the distance on the middle B line. We could construct a separate chart for each value of β, and if the three lines were equally spaced, the scale divisions on the B and C lines would have to be different on each chart. It has already been explained that any alteration of the position of the B line alters the scale on the C line. By suitably choosing a different position of the B line for each value of β, we can therefore make the scale on the C line the same for all values of β. Then the various charts can be superposed, and will give us one A and one C line, but a number of B lines, one for each value of β. If the B line is moved so that its distance from the C line is p and the distance between the A and C lines is P, it follows from equation (2) given already, that the scales are determined by the formula—

$$\mathrm{Fe}-\mathrm{P}/p\times\beta\ (100-\eta)+(\mathrm{P}/p-1)\times\beta^2\ \mathrm{Cu}=0.$$

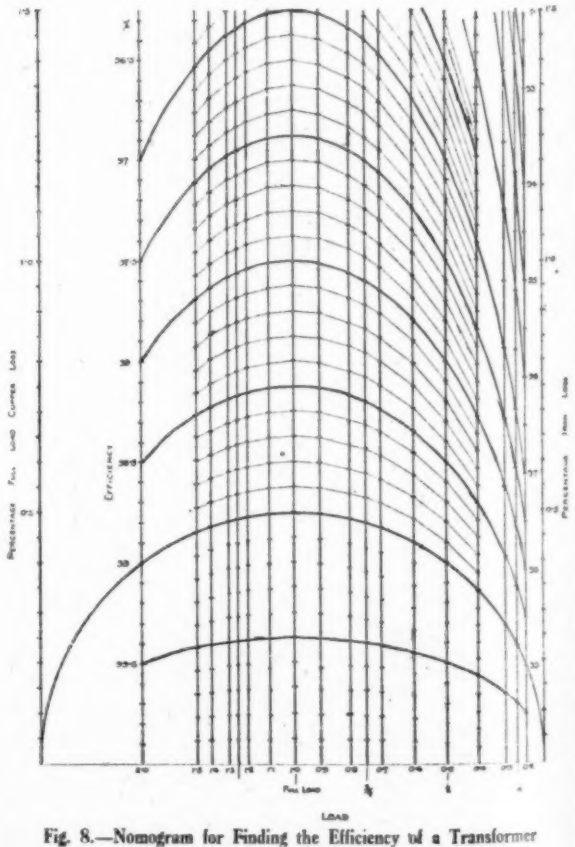


Fig. 8.—Nomogram for Finding the Efficiency of a Transformer at any Load.

It is now easy to see where the B line must be in order that the scale of copper loss may be the same as that of iron loss.

What we want to do is to multiply the scale by $1/\beta^2$. The displacement of the B line from the centre causes us to multiply this scale by $1/(\mathrm{P}/p-1)$. So we must make $\mathrm{P}/p^2-1=\beta^2$ or $p=\mathrm{P}/(1+\beta^2)$. The scale on each B line must be multiplied by p/P, so the functioned scale on this line becomes $\beta/(1+\beta^2)\times(100-\eta)$.

We now have only to choose convenient values for unit length such as, say, 1 per cent. = 10 in., and a convenient value for P such as 10 in., and we can construct all points of the chart, which assumes the appearance shown in fig. 8. It can be shown that the lines connecting points of equal efficiency are ellipses. The reader should not be confused by the fact that on this drawing the A line is on the right and the C line on the left, contrary to our usual custom. The point at which a line connecting the percentage iron and full load copper loss is tangential to one of the ellipses gives the load at which the transformer has its maximum efficiency.

Slanting Line Charts with a Grid.

We can now consider a much simpler type of four variable chart. We have seen that expressions of the form given in formula (3) $A/B=C$ can be represented by slanting line charts. If a fourth independent variable is added to one of the others, giving the form

$$(A+D)/B=C \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4)$$

the two functions of C and D can be combined to give a grid or co-ordinate system of their variables.

If $D=0$, we have a chart as given in fig. 5 (p. 572). On this $A=0$ at point O_A. If $D=D'$ we get a correct chart if the C line passes through O_A' for which $A+D'=0$, so that $O_A O_A'=D'$. We thus get a series of C lines all connecting O_B (the point for zero value of function B) with O_A, O_A' O_A'', &c. corresponding to different values of D, namely, 0 D′ D″, &c. The position of a given value of C is determined by the ratio p/q (see fig. 10), and so all equal values of C lie on straight lines parallel to the A and B lines.

As an example of a nomogram of this type we will take the case of a merchant who purchases a certain article at a given price. He has certain expenses in connection with this article, and wants to calculate the sales price so as to make a certain profit on returns. His calculations will be rather complicated ones, and still more so if he is allowed a discount, which we will assume to be 1.5 per cent., on the price which

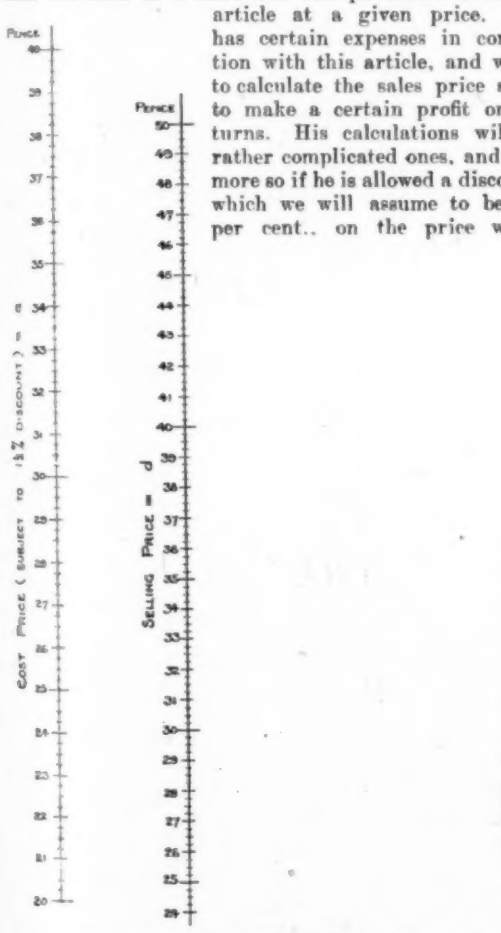


Fig. 9.—Cost of Cotton Yarn.

his supplier quotes him. Expressed in a formula we can say—

$$0.985\ a+b=(1-c/100)\ d.$$

Where a equals the purchase price the supplier quotes, b equals the merchant's expenses, c equals the profit on returns which the merchant wishes to make, d equals the price at which the merchant sells the goods. It will be recognised that this formula is of the form given in (4) above—

$$(A+D)/B=C.$$

In making the nomogram (fig. 9) it will be convenient not to place our divisions on the C line between the A and B lines, but on this line produced beyond O_A as this gives us a rather more open spacing. The various

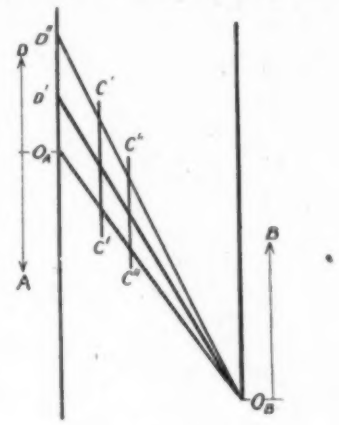


Fig. 10.

C lines corresponding to different values of the merchant's expenses b converge on O_A where the purchase price is zero.

Charts for Curved Lines.

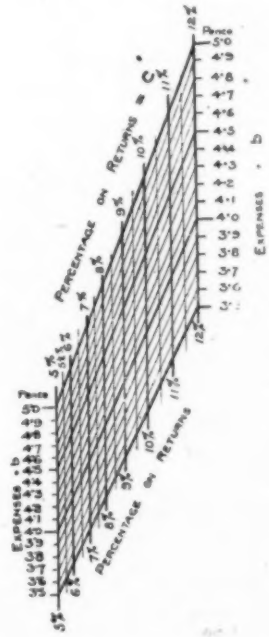
This type of chart occurs rarely in practical work, and a passing reference for the sake of completeness and theoretical interest may suffice. The conditions involving such a chart take the form—

$$A-B+C\times B'=0 \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (5)$$

where B and B′ are different functions of the same variable. If we compare this with formula (2), namely—

$$A-P/p\times B+(P/p-1)\ C=0,$$

we see that we can treat the new formula (5) as a three-line nomogram as long as we choose the spacing between the lines such that $P/p-1=B'$. In order that this may be done P/p must have a different value for every value of the variable of which B and B′ are functions. As P/p is the ratio of distances of the B line and the A line from the C line, a variable value of p/P causes the B line to be curved; we might say that multiplying C by B′ pulls the B line over.



An example of this condition is implicitly contained in fig. 8. Let us imagine this chart constructed for one efficiency only, say, 99 per cent. In this case the chart would consist only of the two A and C lines containing scales of copper and iron losses respectively, and of a semi-circle corresponding to 99 per cent. efficiency. All the ellipses and all the vertical lines would disappear and we should have a scale of transformer loading on the semi-circle. The formula would simplify down to—

$$Fe-\beta+\beta^2\ Cu=0.$$

Another example of this type is given by the chart for finding the weight of tubes. The formula is—

$$w/s-t^2-td=0.$$

A comparison with the familiar type of three-line chart would suggest that the functional scale of d would have to be different for every value of t. In order to retain the same scale divisions on the C line we must

arrange to have a factor $1/t$ by which this scale is multiplied. We remember that the scale is affected by the position of the B line between the A and C lines, and so a different distance of the B line from the other two for every value of t is indicated. If the distance between the A and C lines is P and a point on the B line is at a distance p from the C line, we have seen that the geometrical relationship holds—

$$A-P/p\times Bt+(P/p-1)\ C=0.$$

In order that such a chart may give us the required algebraic values unit length on the scale on the C line must be

$$1/(P/p-1)$$

of unit length on the scale on the A line and unit length on the scale on the B line must be $1/P/p$ of unit length on the scale on the A line.

Hence we correct for the influence of the factor t by making $P/p-1=t$ or $p=P/(t+1)$.

The scale on the A line is therefore a functional scale of W/s, the scale on the B line a functional scale of $p/P\times t^3=t^3/(t+1)$ measured parallel to the A and C lines and the functional scale on the D line is a scale of $-d$, or, in other words, an even scale reading in the opposite direction to the other two.

The position of every point for t is therefore a distance from the C line $=P/(t+1)$, and a distance from a line joining O_A and O_C, and parallel to the A and C lines of $t^3/(t+1)$. Fig. 11 shows the completed chart.

If we return to equation (5) we notice that just as we get the expression giving three straight parallel lines if $B'=1$, so do we get the expression giving two parallel and a straight slanting line if $B=0$. This leads us to realise that a more generalised treatment of the subject would have been more scientific. All types of nomogram become in fact special cases of some more general case. A much generalised treatment of a subject, while appealing to the mathematician, is, however, often less comprehensible to the applied scientist than a discussion of special cases.

Summary and Practical Hints.

1. An alignment chart is worth constructing where it is required to solve frequently a mathematical equation containing three or more variables, and a very high degree of accuracy is not essential. The method has the advantage over the slide rule that errors, and particularly errors in the position of the decimal point, are not made so easily.

2. To begin with, the equation must be got into such a form that the variables are separated. By this is meant that the equation is brought into a form in which it represents the *sum* or *product* of a number of terms where each term is a function of only one of the variables. We refer to these terms as A, B, C, D, &c.

3. Wherever possible the equation should be got into the form—

$$A-B+C=0.$$

In many cases this can be done by taking logarithms. In this form the chart consists of three parallel straight lines and is the simplest type to construct.

4. These three parallel straight lines should be equidistant in nearly every case; an exception may be allowed if unequal spacing allows available logarithmic scales to be employed. In the great majority of cases with equal spacing of lines the nomogram consists of logarithmic scales which can be directly copied from the scales on the slide rule.

5. The rule to determine which way the scales run is that if two successive terms are of opposite signs their scales run the same way; if two successive terms are of the same sign their scales run opposite ways.

6. Precise values must be calculated to satisfy one example of the formula. These may be the roundest numbers possible so as to simplify the arithmetic. A straight line called the tie line must be drawn in any convenient position across the paper. At the points where this cuts the scale lines write the values of the example chosen. This fixes the position of the scales. The angle at which the tie line is drawn should be such that all useful values of the variables are conveniently placed. Sometimes one can choose the example for values making all the terms zero. Often it is better to make the example correspond to average values so that the tie line can cut the scale lines at an angle not greatly different from a right angle.

7. If the expression consists of the form $A/B=C$, it can be generally reduced to the previous form by taking logarithms. If this is not practicable the nomogram consists of the slanting line or N type, the A and B lines are parallel, the C line joins the zero of their two scales. In N type diagrams the scale markings on the C line may either be on the portion between the A and B lines or on the C line produced beyond these. In the former case the scale markings may come inconveniently close together. If the markings are between the A and B lines, the scales on these will run in opposite directions. If the markings are outside the A and B lines, their scales will run in the same direction.

8. If the expression is of the form $A-B+C-D=0$, the nomogram consists of five parallel straight lines, the middle one of which is a pivot line. It is often convenient to arrange for the pairs of lines on each side of the pivot line to coalesce, thus reducing the number of lines in effect to three and to mark a scale for one variable on one side and for the other variable on the other side of the same line.

9. If the expression is of the form $(A+D)/B=C$,

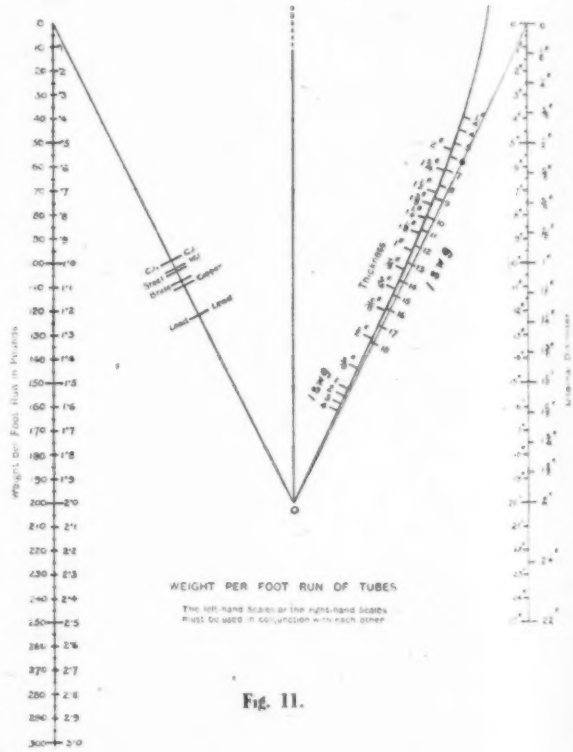


Fig. 11.

the nomogram will be of the slanting line type with a grid, the grid containing the co-ordinate system for the A and D and the A and B terms being on the two parallel straight lines.

10. If the equation is of the form $A-B+B\times C=0$, the nomogram will consist of three lines, of which two are parallel and one is curved.

11. In constructing a nomogram it is convenient to draw it not in the position as generally looked at in which the parallel straight lines are vertical but with these lines horizontal. It is quicker to mark the scale division by moving the light set square than by moving the heavy T-square.

12. It is often advisable to make any scale in two systems of measurements, for instance, in degrees Centigrade and degrees Fahrenheit, the one system being written on one side and the other on the other of the scale, and a great advantage of nomograms is the ease with which this can be done and the resultant saving in the work of converting units.

Electricity in Agriculture.

Rural Electrification and Electric Ploughing.

By J. A. SUMNER.

THE uses to which electricity is devoted may be divided broadly under three main headings, *viz.*, industrial uses, household and domestic uses, and to fill the needs of agriculture. Of these, the last is the Benjamin of the trio—in age—but unfortunately not in favour. It is the desire of the writer to indicate the potentialities that exist for the use of electrcity in agriculture and rural areas in general, and, in suggesting methods which will bring it more widely into favour, to hint at some of the difficulties which lie in the path of progress.

It is estimated that England possesses many hundred thousands of acres of land under cultivation each year, the vast bulk of the work being done by the time-honoured if slow and tedious method of utilising the greatest literal horse power that is available and manageable by one man to drag the appropriate plough or other implement that is being used. Let us concentrate for the moment on the skilled operation of ploughing; a comparison between the results achieved by the former method and those which may be attained by the substitution of electrical energy as the motive power may not be invidious. In each case average land is taken as a basis for comparison. A ploughman with two horses would look upon one acre of ploughing as a good day's work, whereas with an electric plough several acres of land may be ploughed in a similar time.

The point in which advantage is gained with an electric motor is that far more power may be concentrated and controlled more easily than is the case with the horse-drawn plough, and whilst the cutting speed of the electric plough is not higher (although this can easily be achieved) since there is a limit to the speed for good ploughing, two or more furrows may be turned at one operation.

The writer thinks it possible that a practical system and machine—employing the tractor method—may be devised which will eliminate the "panning" of the soil due to the passage of the heavy tractor, which causes the soil to become more solid under compression, subsequently "ripping" over in solid layers instead of breaking up as it is thrown over by the plough. The manner of ploughing is an important factor, and it is claimed that with electric ploughing the crop yield has been proved to be from 20 to 35 per cent. greater.

There is another method offering more possibilities, in which the "roundabout" haulage system is employed and a type of plough having four shares, cutting two furrows on each side per journey across the field one way, is used. By a simple system of anchors and pulleys and a drawing rope which is wound at will on one of two winding drums on the motor, unwinding from the other pulley as it does so, the plough is drawn across the field. It is quite possible to utilise this method with only one man in sole charge. The number of ploughs of this type in use in this country is painfully small, being exactly one.

During a recent conversation between the writer and a landed proprietor owning a large estate, the latter stated that he would be unable to break up a large amount of land that was urgently in need of ploughing, as his men had far more to do than they could manage; he had no more horses available for the purpose, and it was impossible to obtain the services of a motor tractor. What was wanted, he stated, was some method that would enable him to plough more land in a given time, with results equal to those obtained at present. Surely electricity can come to his aid! It would seem that if rural supply authorities were initially to do the farmers' ploughing by contract, an immense material benefit might ensue. To the small farmer it would be a boon, in that he would be able to reduce his overhead charges due to the maintenance of an extra horse and plough, and in the limit would only need a horse for carting manure and transporting produce. Experience also shows that the larger farmers would eagerly welcome such assistance, as an auxiliary to their present facilities.

As to comparative costs, in the present state of the application of electricity to agriculture, one cannot be dogmatic in assertion nor are there any definite figures regarding the cost of electrical ploughing that can be taken as a criterion. The following figures will undoubtedly be criticised, as it is hoped, but the basis is one which cannot easily be obtained from manufacturers' costs or from experience; it is one which, the writer hopes, will be the nucleus of a scheme to be worked in Cheshire. Any corrections which are needed or any practical working costs which may be obtained will therefore be welcomed:—

Data: 15-h.p. motor.
Cost of energy, $\frac{3}{4}$d. per unit.
Rate of ploughing, $\frac{1}{2}$ acre per hour.
Cost of machine and accessories, £500.

Costs based upon one acre of ploughing.
(*a*) Cost of electrical energy, 1s. 7d.
(*b*) Cost of labour (at 1s. 3d. per hour), 2s. 6d.
(*c*) Depreciation = 5 per cent. per annum (assuming 600 running hours = 300 acres per annum), 1s. 8d.
(*d*) To cover capital cost (assume life of machine = 10 years), 3s. 4d.
Total of *a*, *b*, *c* and *d* = 9s. 1d. per acre.

It will be obvious that the cost per acre essentially depends on the number of acres ploughed per day, as will be seen from the following, using the above data.

Rate of ploughing.	Cost per acre.
$\frac{1}{3}$ acre per hour	13s. 4d.
$\frac{1}{2}$,, ,, ,, ...	9s. 1d.
$\frac{2}{3}$,, ,, ,, ...	7s. 1½d.
1 ,, ,, ,, ...	6s. 0d.
2 ,, ,, ,, ...	5s. 0d.

The standard prices for ploughing, as given officially, are at the rate of 20s. per acre.

The importance of a higher rate (not speed) of ploughing is obvious, and from a comparison of the prices which obtain and the prices which our basis of costs allows, there is scope for experiment so as to be able to reach a rate of good ploughing of from $\frac{3}{4}$ to one acre per hour.

It seems clear that the revenue accruing from this operation will not unduly inflate the dividends of the supply company, and also that whilst the capital invested would be covered it would be necessary to have a guaranteed area for work each year, to cover the capital costs incurred; but we must remember that this is pioneer work, primarily to impress the farmer with the usefulness and advantages of electricity for his multifarious purposes. The indirect gains which would be made by the supply undertaker if the operations were shown to be successful are those of a better load factor and an increase in the number of units sold.

The operation of artificially drying hay and corn crops and securing independence of weather conditions is one in which we can render assistance. The long series of finally successful experiments made by independent experimenters and also under the auspices of the Ministry of Agriculture tends to show that the farmer must more and more resort to electrical aid, and we must remember that as agricultural labour is scarce at the moment and is subject to seasonal demands, a reduction in the number of labourers and horses required may be gratefully accepted.

If we can consider our premises to be correct and, as an industry, can be fully convinced of the utility of electrical aids to the farmer, it is perhaps wise to consider the requirements for supplying this aid. That a fairly extensive network of overhead lines is required —adjacent to fields—and at a pressure of, say, 3,000 volts, with suitable cheap tapping points for connection to a transformer for low-pressure supply, is fairly evident. The essentials for such a line would be: freedom from onerous conditions often imposed by landowners upon wayleaves for poles; assistance from the manufacturers of overhead gear, switches, &c.; and an avoidance of regulations which impose a factor of safety of 10 to the *n*th power.

To indicate some of the difficulties which beset our path: First, there is that often conservative and variable factor—the farmer, who seldom sees the benefits that may accrue to him. To say that his fields can be cultivated electrically in a superior manner to his present method of cultivation (this, of course, needs to be a matter of fact) or that scientific methods must supersede more laborious methods, leaves our would-be convert quite cold; but to guarantee to do such work to his satisfaction at a less cost than he can do it himself may cause him to open both heart and purse. Here one may state that the electrical sword may be two-edged, as is shown by the fact that wayleaves are often hard and dear to obtain, the objection being that much more time is required to work around the poles, in addition to the disadvantages of a "lozenge" of land that goes out of cultivation. If the work were done in these early stages by the supply authority under contract, as previously suggested, it would be necessary to justify our claim that a pole in the middle of a field causes little trouble or loss to the farmer, and the onus and penalty of placing a pole in an arable field would devolve upon those responsible for such a crime!

Summing up, we may state that for rural electrification to be a success the following are the main desiderata:—

(1) That there be an extensive and cheaply erected network of lines adjacent to land other than permanent pasture, either at a medium pressure of 200-400 volts or at a high pressure of about 3,000 volts. Considerations of cost demand that these should be single- or two-phase, if alternating current, or, alternatively, that they be direct current at, say, 200-800 volts. The former method would involve the use of a 10-15-kVA portable transformer to give a low-pressure supply. These lines would not be used entirely for the purpose of tapping for operations in the field, but they would help to justify the erection of a line to a scattered hamlet or even a farm for domestic use, where normally such a line would not be an economical proposition, and in this way they would *cheapen the cost of erection per mile*. An isolated farm or group of houses such as one commonly meets in rural areas is a fertile place for the installation of electrical apparatus as an aid to comfort, and will become increasingly so as the electrical gospel becomes more and more a part of our normal lives. Possibly it seems as strange to imagine electric ploughs or reaping machines let out on hire, or on a hire-purchase system; as it was to the people of Glasgow to conceive that the electric lamp first used in Lord Kelvin's house would become a commonplace object twenty years later.

(2) That wayleaves for poles be easily and cheaply obtainable. It may be pointed out that the apparently standard rents for poles which the Commissioners seem to be fixing, judging from the results of inquiries, of 8s., 4s., and 2s. per double pole, depending on their position, are far too high for successful rural distribution, and will militate against a reasonably cheap distribution in any except industrial areas with their large consumers.

(3) That initially the responsibility for work involving horses and machines be removed from the farmer to a competent supply authority (the work, of course, being done to his satisfaction) and that not only must the cost of operation per acre be less than previously but that the farmer must be enabled to reduce his overhead charges. Selling a horse which needs feeding with energy at a cost probably far higher per unit than that of electrical energy will enable him to purchase two motors for his dairy or granary.

Condition (1) rests not only with the farmer but with those responsible for the regulations governing the distribution and supply of electrical energy. An engineer recently wished to reduce the cost of overhead lines for 220 volts, a.c., and applied for permission to run a single wire with return *via* Mother Earth. He also had the audacity to state that the system of guarding required by the authorities for the crossing of power lines (e.h.p.) over telephone lines was unnecessarily cumbersome and costly. Why, for instance, should not the crossing and guarding be supported from wood poles instead of from the more expensive steel lattice towers? —and why, if the line were to break—a rather hypothetical happening—should such elaborate precautions have to be taken to ensure that they would not touch the earthed guard erected to catch them?! And he asked for permission to run the single wire, also to erect a cheaper crossing which would still have a sufficiently high factor of safety. Copernicus was not more ill-thought of, and the theological authorities are still debating the motion of the solar system. The question of being able cheaply to tap 33,000-volt lines also arises, since these lines are almost always run through fields and adjacent to the particular type of country with which we are concerned. It is possible to tap a 3,000-volt line at £25 (this being the cost of a 5-kVA transformer and switch), and the saving which may be effected in rural distribution if a tapping can be made from a 33,000-volt line at a cost of, say, £20, makes the matter extremely interesting and important.

Condition (2) will resolve itself, and may hardly be looked upon as a difficulty unless the Commissioners attempt to fix a standard price per pole.

Condition (3), which is in the nature of a suggestion, constitutes a difficulty in itself, and if a few authorities are willing to take over such a responsibility, it will be necessary for a large area to be guaranteed to be at their disposal each year. In any case it means the expenditure of a fair amount of capital which, although the writer thinks it would be covered, might only return a profit of perhaps 1 to 5 per cent.—the amount depending entirely upon the amount of work available. But if the farmer will go to the expense of purchasing, or at least hiring, a petrol-engined tractor plough, which he will state quite frankly does not do the work to his satisfaction, why should he not turn to electrical methods?

In conclusion, I would point out the essential difference between industry and agriculture: the former is mobile, in that it can gravitate to the locality where power is cheap and easy to obtain; but agriculture, with a possibly greater need for an abundant supply of energy available cheaply and easily, is immobile, and it remains a pressing problem for the electrical engineer to erect power lines which will be the means of conveying that energy to the fields and farms.

Monorail in Railway Workshops.—A New York correspondent of *The Times Trade and Engineering Supplement* states that in the shops of the United Railways of St. Louis a very complete monorail system handles various equipment parts with facility. This overhead system extends throughout the different departments of the shop, with branch lines running directly to the work benches and the machine tools. The monorails are so placed with respect to the machines that material is deposited adjacent to them and can be handled with the minimum of labour. Each important machine tool is served by a jib crane in addition to the monorail system. These jib cranes are so arranged that the heavy parts of trucks and railway motors can be lifted readily and placed in position on the tools for machining, an air hoist or a chain block being used, depending upon the height of the lift and the material being handled. In several cases the parts can be transferred directly from one machine tool to another without the intervention of the monorail system. This method of handling parts in the repair shop has effected a marked reduction in wasted time, with corresponding savings in the labour cost.

A Survey of Lighting in Electrical Showrooms.

By W. E. BUSH.

THERE can be few electrical engineers in this country to-day who are not aware that the methods of employment of electrical energy for lighting purposes are open to vast improvement. Throughout the length and breadth of the land are to be found innumerable examples of bad lighting. In fact, the actual state of affairs, at least so far as shop windows are concerned, is represented by diagram 1. From this it will be seen that 61 per cent. of retail shop windows are poorly lighted, while another 21.5 per cent. are only "fair."

Evidently here is matter for thought. In terms of £ s. d. the value of the field that lies between actual practice and best modern practice is estimated to be worth some £5,000,000. This, it is true, would go to the makers of and dealers in equipment and contractors for electrical wiring, but the increased consumption of electrical energy involved in this change would mean a considerable addition to the revenues of supply undertakings, since, even as things are at present, something like 46 per cent. of their total revenue is derived from "lighting." The difficulty, of course, lies in persuading the shopkeepers to adopt the best methods. Not only must they be told that efficient equipment is available which will mean an increase of income much beyond expenditure, but they must also be shown this equipment in actual use. As the well-known saying has it: "An ounce of practice is worth a pound of theory"; and this is undoubtedly true of electric lighting, for wherever the latest types of lighting units are seen in action their value is appreciated.

Hence it is obvious that in every possible way the electrical trade should set a good example to the ordinary shopkeeper.

Nevertheless, a survey of 139 showrooms of supply undertakings, made with a view to ascertaining how they stood in this matter of window lighting, revealed

Fig. 1.—Shop Windows.

Fig. 2.—Showrooms.

some rather surprising figures. The standard by which they were judged was the same as that applied in the case of the general retail shops, namely, complete absence of glare, use of top reflectors, and the consumption of at least 90 watts per foot run of window. As will be seen from diagram 2, only 3 per cent. reached a level of excellence, while 73 per cent. varied between fair and definitely poor. In only 42.5 per cent. of the windows examined were top reflectors employed, and about an equal number were lighted by pendants, thus leaving more than 15 per cent. with bare lamps. Diagram 3 shows in a compact form the relative proportions in which these types of equipment were used.

After-hour lighting was employed by only 16 per cent. of the total, while just over 11 per cent. made use of colour lighting as a source of attraction. In only 17 per cent. of the cases considered were electric signs employed, in spite of the fact that most supply undertakings are to-day urging their customers to use after-hour lighting and signs as much as possible.

Indeed, on looking the matter squarely in the face, it seems as though the pupil is more learned than his master. A glance at the three diagrams will suffice to show that this is no unfair metaphor. Evidently such a state of affairs is far from desirable, since it involves the possibility of the electrical industry losing prestige as a force sincerely bent on serving the community. It must either lead or be led, and there can be no question as to which alternative it will adopt.

Fig. 3.—Types of Equipment.

During the next few months a great deal can be done to stimulate an interest in good shop lighting. Nearly half the supply undertakings have premises in good-class thoroughfares, and it is therefore possible for these to set such a standard in window lighting as to awaken in even the most apathetic shopkeeper a vague uneasiness not to be set at rest till he has given serious attention to the state of his own lighting equipment.

The Corrosion and Protection of Condenser Tubes.—A publication of the Institute of Metals, "Notes on the Corrosion and Protection of Condenser Tubes," has been prepared at the instance of the Corrosion Research Committee of the Institute by Messrs. G. D. Bengough, M.A., D.Sc., and R. May, A.R.S.M. It contains much new and important information on the subject which has been acquired since the last similar publication in 1921. Three types of factors are closely concerned with the subject of corrosion of condenser tubes, namely, chemical and electrochemical reactions, engineering and physical conditions, and metallurgical factors; on these the "notes" on the causes and methods of prevention of corrosion are based. Six types of corrosive action in condensers are named, and each is dealt with separately, the special conditions under which each action occurs being cited. Several causes of failure due to the tubes themselves are mentioned, the most important consideration in this direction being the composition of the metal. Such metals as lead, iron, manganese and nickel may be included in the composition of the tubes with advantage in a certain proportion, but harm may result from any of these elements being misproportioned. It is interesting to note that aluminium should be rigorously excluded. Great attention is paid to the causes of failure due to external conditions which call for consideration of the following factors: the nature of the vortex or other motion in the water box, the type of disturbance set up by the ferrules, &c., the occurrence of obstructions to flow in the tubes or ferrules even when very small, the size of air-bubbles, the foaming properties of the water, and the supersaturation of sea-water with gases. Of the possible methods of lessening corrosion, several are dealt with under the two main treatments, the water treatment and that of the tube itself. The methods of treating the water are classified as physical (filtration), chemical (softening, neutralisation, &c.), and electrolytic; while the tube treatment includes the following methods: protection by insoluble scales, by metallic layers (tin, lead, &c.), by impervious layers of inert substances, tube cleaning, and annealing at low temperatures in oxidising atmospheres. Each method is described and criticised in turn, and many valuable suggestions are given. Both treatments are given prominence, but the modern tendency seems to favour the tube treatment. Good results have been obtained by protecting the tubes by means of layers of basic salts and also by metallic layers. Unfortunately the annealing process has not given such good results in practice as were promised by the results of laboratory tests. The various methods of preventing corrosion and the fields of application of protective processes are given in tabular form. Considerable information as to the research at present being carried out is also included in the pamphlet.

Electricity Supply in Great Britain.—II.

The Situation in Kent.

In dealing with the County of Kent it will be found convenient to divide the authorised undertakers into two groups, *viz.*, Group 1, those included in the London and Home Counties Electricity District, and Group 2, those outside this District. The area covered by the latter is identical with Area No. 14 in the Electricity Commissioners' publication dealing with the Generation of Electricity in Great Britain, price 1s. 6d. In Table 8 of this pamphlet, the particulars of kWh generated by the different classes of stations are set out, together with the amount of fuel consumed by each class. The last column gives the total number of kWh generated in the area, as follows:—

Year ending March 31st,	1922	31,506,343
Do.	1923	39,716,403
Do.	1924	46,904,432
Do.	1925	55,869,304
Do.	1930 (estimated sold) ...	80,000,000

We have added our estimate for the output sold five years hence, and trust that the undertakers concerned (either individually or collectively) will not fail to justify our forecast. The portion of Kent not included in Fuel Consumption Area No. 14 is, as stated above, included in the London and Home Counties Electricity District. The London County Council publication relating to Electricity Supply in the London and Home Counties Electricity District deals very fully with this, and by putting both sets of particulars together one can obtain a fairly comprehensive record of the County of Kent for the last few years. On referring to the Electricity Commissioners' Volumes of Returns of Administrative, Engineering, and Financial details, it will be found that although the whole county, with the exception of the Isle of Thanet, is practically covered by the various Acts of the Kent, South East Kent, and West Kent Companies, the total annual output of these associated companies is only about ten million kWh sold, including bulk supplies given to other undertakers. As will be seen from the map on the opposite page, the north-west corner of Kent, which lies within the new Electricity District recently confirmed by Parliament, is practically covered by statutory powers.

The whole administrative County of Kent, together with the County Borough of Canterbury, comprises 975,965 acres. According to the 1921 Census, the population comprised 1,141,666 persons and 252,936 resident families. Table 10 shows that there were 12,892 buildings not containing dwellings, so that in all we may reckon that there are about 266,000 potential consumers.

The following is a list of the generating stations in Kent:—

(1) London and Home Counties Electricity District.
Gravesend Corporation.
Beckenham Urban District Council.
Bexley Urban District Council.
Dartford Urban District Council.
Erith Urban District Council.
Sevenoaks and District Electric Co., Ltd.
Bromley (Kent) Electric Light and Power Co., Ltd.
Total—7 stations.

(2) Area No. 14 of Generation of Electricity pamphlet (*i.e.*, the remainder of Kent).
Canterbury Corporation.
Faversham Corporation.
Dover Corporation.
Maidstone Corporation.
Tonbridge Urban District Council.
Tunbridge Wells Corporation.
Gillingham Corporation.
Chatham and District Light Railways.
Isle of Thanet Electric Supply Co., Ltd.
Ramsgate and District Electric Supply Co., Ltd.
Folkestone Electric Supply Co., Ltd.
Whitstable Electric Co., Ltd.
Sheerness and District E.P. & T. Co., Ltd.
Kent Electric Power Co. (Rochester).
Total, 14 stations.
Grand total, 21.

The number of authorised undertakers in Kent at the present time is 26. The area of supply of 23 of these is wholly within Kent, the exceptions being the Weald Electric Supply Co., Ltd., the South Metropolitan Electric Light and Power Co., Ltd., and the Sevenoaks Company. The Weald Company's area extends into Sussex, but as this company has not yet commenced operating, having only just been formed, it will not affect the totals given below. The part of Kent belonging to the South Metropolitan Company is Penge Urban District, and as separate figures are not available for this area, this undertaking is omitted from the following figures. At present, we believe, no electricity is supplied by the Sevenoaks Company to the part of its area outside Kent. The South-East Kent Electric Power Co., Ltd., is also omitted, as it is not now operating. The remaining 23 undertakers have been divided into two groups, as stated above. The Kent Electric Power Company belongs to both groups, but only appears in Group 2, as it is not operating in Group 1.

	Max. Load, kW.	Total kWh sold.
Total for Undertakers in Group 1 ...	13,199	27,301,226
Total for Undertakers in Group 2 ...	16,338	29,283,657
Aggregate for the whole county ...	29,537	56,584,883

These data are the latest published by the Electricity Commissioners, except that the maximum load of the West Kent Electric Co. is assumed to be 2,000 kW.

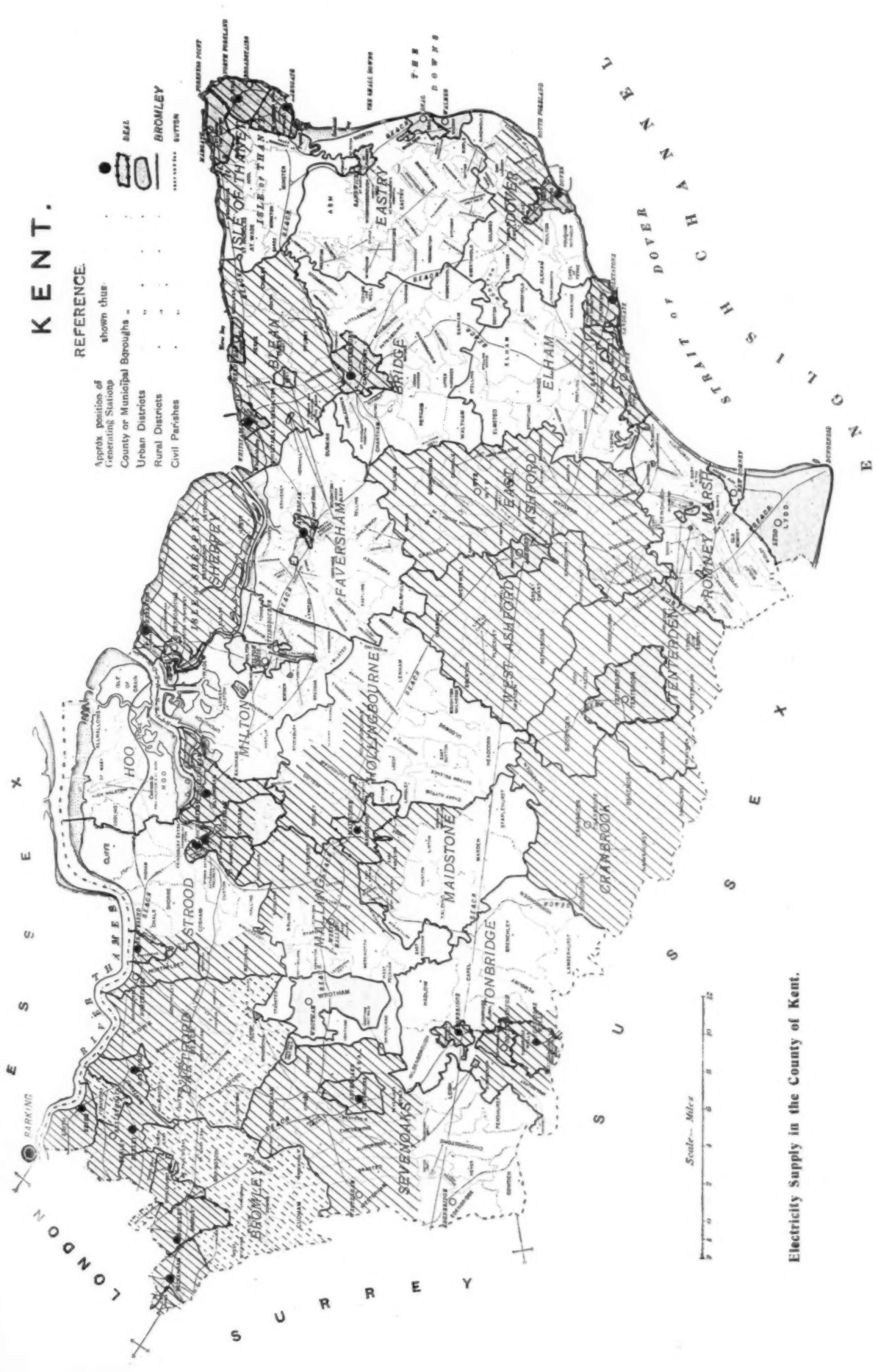
It is interesting to note that 20 of these 23 undertakers possess generating stations, as can be seen from the map. The Chislehurst, Foots Cray and West Kent Companies purchase the whole of their output.

Space does not permit of a detailed list being given, showing the respective areas of each of the 26 undertakers in Kent, but the information is very clearly set out in the Electricity Commissioners' 10s. volume, published in January, 1925. The only additions to be made since December 31st, 1923, are that the area of the Isle of Thanet Electric Supply Co., Ltd., has been enlarged by the inclusion of the parishes of Westgate-on-Sea and Birchington; and that the new undertaker—the Weald Electric Supply Co.—does not appear prior to 1924. It possesses full powers for electricity supply over the following areas:—Cranbrook Rural District; Tenterden Municipal Borough; Tenterden Rural District (except detached portions); and Ticehurst Rural District (Sussex).

The map is based upon the Ordnance Survey map prepared for the Boundary Commission of 1917, which has been used by permission of the Controller of H.M. Stationery Office. As before, the hatched portions represent the areas already covered by statutory powers, either granted or applied for. Over part of its area the West Kent Electric Company has special powers to distribute electricity to consumers, besides supplying in bulk, and this part has been shaded with dotted lines with the exception of the parishes of Darenth, Fawkham, Hartley, Horton Kirby, Longfield, and Southfleet, in Dartford Rural District; these parishes form part of the area applied for by Gravesend Corporation, and are shaded therefore by full lines.

The following alterations have been made since the map was engraved:—

(1) Crayford Parish has been created an Urban District.
(2) A small part of Tonbridge Rural Parish has been added to Tonbridge Urban District.
(3) A small part of River Parish has been added to Dover Municipal Borough.
(4) The parish of St. Lawrence Intra has been merged into the parish of Ramsgate, which is now co-extensive with Ramsgate Municipal Borough.
(5) The Urban District and Parish of Footscray has been re-named Sidcup.



Electricity Supply in the County of Kent.

D

Reviews.

Mercury Vapour Rectifiers and Mercury Vapour Lamps. By J. A. Fleming, M.A., D.Sc., F.R.S. Pp. viii + 100; figs. 44. London: Sir Isaac Pitman & Sons, Ltd. Price 6s. net.

This work by Professor Fleming is described by him in the foreword as "a small treatise on the modes of operation and uses of the mercury-vapour rectifier and the mercury vapour lamp."

The author devotes the first two chapters to a *résumé* of the atomic structure of matter and of electricity, and to the phenomena observed in the ordinary carbon arc. The account of the atomic theory is worth reading for itself, and is one of the clearest non-technical descriptions on the subject that we have seen.

The third chapter describes the mercury-vapour lamp in glass and in quartz and gives concrete examples of the theories introduced in the previous chapters. We are surprised that more space has not been devoted to the therapeutic uses of the mercury-vapour lamps in quartz. This "artificial sunshine" so beloved of the daily Press is of great and ever-increasing importance in the treatment of tuberculosis and certain skin diseases. Very valuable work is being done in this country and on the Continent, and it would seem that before many years have elapsed medical practitioners will make extensive use of the "ultra-violet" light of which the mercury-vapour lamp in quartz is the only commercial source at present.

To purely electrical engineers the mercury-vapour lamp is of greater interest as a source of light for general illumination. The author would have assisted them very greatly had he given comparative data of the cost of this lamp and the gas-filled metal-filament lamp.

Chapter IV deals with the glass bulb rectifier made by the Hewittic Electric Company, and Chapter V with the metal cylinder rectifier made by Messrs. Brown, Boveri.

These two chapters give fairly good accounts of both types of rectifier, but contain no more information than may be obtained from literature supplied by the respective manufacturers. The blocks also with but few exceptions have been obtained from the same sources. The same criticism applies with equal force to the chapter dealing with mercury vapour lamps, and we feel that six shillings is too much to ask for 100 octavo pages of such compilation.

An operating engineer's first consideration when choosing plant is reliability, his second, overall costs. If he seeks for information regarding first costs, running costs, and maintenance charges in this book, he will seek in vain. Neither is anything said about the parallel running of mercury-vapour rectifiers with other machines or with other and similar rectifiers.

In the absence of information to the contrary it must also be assumed that motors, supply meters, and instruments do not differentiate between rectified current and d.c. current obtained from dynamos or converters. We believe this is the case, but some engineers have an exaggerated idea of the amount of ripple and are afraid of its influence on their mains and outside plant. We think the various makers would do well to dispel these fears by publishing oscillograms and by practical demonstrations.

It is true that the author refers his readers to a paper by Mr. G. Rogers published in the I.E.E. *Journal* for February, 1925, but we think that a publication aspiring to be a treatise on the subject for the use of engineers should contain within itself adequate data on these all-important questions.

The final chapter deals with the mercury-vapour lamp as a generator of oscillations. This is mainly of theoretical interest and will interest those engaged in high-frequency work.

In conclusion, the book cannot be said to merit the title of a treatise. The information contained therein is certainly accurate, but very meagre. It forms, however, a useful introduction to the subject and then, we fear, engineers desiring fuller information will have to look abroad.

The only English works known to the writer are Mr. L. B. Jolley's book on "Alternating Current Rectification," which was noted in these columns on March 27th, 1925, and the paper by Mr. G. Rogers previously mentioned. The latter is the better one for the operating engineer. It deals almost entirely with the glass-bulb rectifier with which Mr. Rogers has had considerable experience and gives detailed costs.

For similar articles dealing with the metal cylinder genus the reader will be forced to turn to the pages of the *Elektrotechnische Zeitschrift* and the *Revue Générale d'Electricité*. The latter paper has from time to time very interesting articles on the theory of the rectifier, but their reading demands a high standard of French and mathematics.

In passing, it may be said that both types of rectifier are very extensively used on the Continent, but that this country and, singularly enough, the United States have considerable leeway to make up.

Fuel Economy and Smoke Prevention. By J. B. C. Kershaw, F.I.C. Pp. xiii + 268; figs. 91. London: Constable & Co., Ltd. Price 16s. net.

The book under review is the third revised edition of "Smoke Prevention and Fuel Economy," by Mr. Kershaw and the late Mr. W. H. Booth. It has undergone considerable revision and has been extended by additional chapters dealing with the grading of fuel, utilisation of waste steam, and descriptions of recent super-power stations.

Coal will probably remain the principal source of fuel for the world at large, and one of mankind's most pressing problems is how to best use economically, and hence conserve the fuel resources of the world. Low-temperature carbonisation has attracted considerable attention within recent years, but the economic aspect of the question still bristles with technical problems which are now being studied on industrial plant. At present, improvements in the efficiencies of steam-raising plant are being fostered in all parts of the country, and the recently-built large municipal stations have made vast strides in this respect, but it must not be overlooked that by far the larger proportion of fuel is consumed in the smaller plant, the efficiency of which is low. The proposal to establish super power plant at industrial centres throughout the country could not entirely supersede the smaller plants, as the latter supply steam for industrial heating purposes at the factories where they are situated, and no super power plant, however well situated, could attempt to distribute exhaust steam or hot water over a wide area with any degree of efficiency or economic success. The low thermal efficiency of many present-day boiler plants, is due, generally, either to insufficient air supplied at the periods when the hydro-carbon gases are being evolved most rapidly from the fuel, or no proper provision is made for adequate mixing of the heated air and of these hydro-carbon gases. In practice, from 20 to 25 lb. of air is used per pound of fuel, and hence the amount which must be carried either through the fuel or above it into the furnace amounts to between 40,000 and 55,000 lb., or to the enormous volume of between one-half and three-quarters of a million cubic feet per ton of coal burnt. The shortcomings of the present-day methods of burning fuel for steam generation are partly due to faulty boiler and furnace design, and partly due to lack of supervision and efficiency in the operation of the plant. In some of the recently-built power plants, many of these defects have been remedied. The efficiencies of 250 power plants are summarised by Mr. Kershaw, as follows: 98 had efficiencies ranging from 60 to 80 per cent., 109 between 50 and 60 per cent., and 43 of efficiency below 50 per cent. The average efficiency of power plant is highest at paper mills, *viz.*, 71 per cent., compared with 41 per cent. at colliery power plant, which is the lowest; these are significant figures.

In every power plant, large or small, there is scope for the exercise of much ingenuity, and engineering ability in devising inexpensive and simple means for the recovery of the waste heat units.

As the necessity for fuel economy becomes more urgent, it would be well for the chemists and engineers in charge of this highly important section of the plant of our manufacturing industries to examine their steam raising installations, in order to further conserve or recover wasted heat units, without unduly increasing the capital outlay or running costs of the plant. Many problems remain to be solved in this field, and it is important to have in a narrow area of reference, most of the material that makes possible a sorting out of the elements of fuel economy. The whole formation of the book is admirable, illustrations are good, it is well written and interesting alike in the facts it records, and the theories it evolves. The method of presentation of the material is logical and the facts are put forward with clearness and conciseness.

The fairest comment that can be made upon the book, is that the author has accomplished that which he set out to do, and those interested in fuel economy, thermal efficiency, and smoke prevention are indebted to Mr. Kershaw for an extremely useful and stimulating volume. One general criticism should perhaps be registered, and that is the omission of a bibliography.

The Motor-car Show.—The International Motor Exhibition which opened at Olympia on October 8th, has been regarded as the most important of the series from the trade point of view, for there has been no Paris *salon* this autumn. The popularity of the British show is not surprising when the figures issued by the Ministry of Transport last week relative to the number of motor licences in Great Britain from December 1st, 1924, to August 31st last, are considered. The gross receipts amounted to £16,025,527 and the number of motor vehicles for which licences were taken out, excluding tramway-cars, is given as 1,510,000, including: 580,000 cars, taxed on horse-power; 572,000 motor-cycles; 224,000 commercial goods vehicles, and 99,000 motor-hackneys (otherwise omnibuses and other vehicles for hire). The number of motor-cars (580,000) works out at approximately one to every 78 of the population, whereas in America there is one car to about every 11 of the population. The total number of motor vehicles, including those exempt from licences, is given as 1,537,340. The electrical features of the exhibition, which will be dealt with next week, are confined to the lighting, starting, and ignition equipment.

The Manchester Textile Exhibition.—Radical development or alteration in principle of textile machinery has been almost negligible for many years. Nevertheless, new ideas are being promulgated and an inspection of the many exhibits now on view at the City Hall, Manchester, will impress the observer with the fact that great progress is being made. New and radical changes are proposed in many directions, with a view to economy in production, increased output, and better quality of product. A novelty is an electro-automatic loom, details of which we hope to publish in due course, but our review of the show has to be unavoidably held over until next week.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities New Publicity Literature, Liquidations and Failures.

Electrical Activity Abroad.—Several matters of interest have appeared in foreign dispatches to the daily Press during the past week. First the development of the Brown, Boveri schemes in the United States has been before the American investing public, which has quickly absorbed at $50 a share an issue of 260,000 participating shares of the American Brown, Boveri Electric Corporation, in which the well-known Swiss company has a large holding. The intention of the Swiss company to exploit the American market, purchasing a number of individual plants for conversion to its own requirements, has already been fully discussed in these pages. Swiss activity is also noticeable in another of the foreign dispatches, for a *Times* report from Frankfurt states that in connection with the electrification of the railways of the Reich, in the Rhineland, three new power stations are to be erected—partly on Swiss territory—at a cost of £2,240,000. It is added that the concerns financially interested in the scheme are: the North-Eastern Swiss Power Works, the Rheinefelden Transmission Works, and the Baden Works in Karlsruhe. The other report before us relates to Germany and Russia, and it is not one to be viewed with surprise. It is to the effect that an agreement was last week approaching completion between the Russian Elektrotrust and the Allgemeine Elektrizitäts Gesellschaft, by which the former concern will have the right to make use of the A.E.G. technical experience and patents, the company having undertaken to "exchange" technical experience and patents for increased facilities for the sale of A.E.G. products in Russia. So many statements have emanated from Russia lately showing that foreign technical experience and products would have to be resorted to if Russian electrification was to proceed satisfactorily, that the reported discussion does not startle one. A daily paper states that one part of the discussion relates to a large delivery of goods to Russia by the company, for which the Russians require a payment credit of 40,000,000 marks.

The Shannon Scheme Dispute.—The position with regard to the delay of the work on the Shannon scheme has grown more acute, the trade bodies giving support to the unskilled workers, who refuse to accept the wage terms offered by the German contractors, *viz.*, 32s. for a 50-hour week. The Limerick dockers are in sympathy with the men, and no further consignments of equipment are to be handled by them pending a satisfactory settlement. Negotiations between the contractors' representatives, the Free State Government's Labour Director and the men's union, have led to no result. It is stated that the Transport Union has set up a negotiating committee to deal with all questions of wages and conditions of work and that until Messrs. Siemens-Schuckert, the contractors, negotiate with this body no work will be done. The firm, however, shows no disposition to negotiate.

Social Events.—Messrs. Johnson & Phillips, Ltd., of Charlton, held their first staff dance of the season on Friday evening last, October 9th, at the Woolwich Town Hall. Over 250 members and friends were present, and the function was most successful in every way. Prizes were given for "lucky numbers" and "spot" waltzing.

Burnley Electricity Works has won the local cricket club medal competition. The medals were presented to the team by Mr. Starkie, the borough electrical engineer.

The employés of Messrs. C. T. Briscoe & Son, electrical engineers, Blackburn, went for a motor outing to Blackpool on Saturday.

B.I. Works Visit.—Liverpool has just celebrated a Civic Week. Special efforts were made to provide attractions for the great influx of visitors to the city. The Prescot factory of British Insulated & Helsby Cables, Ltd., was thrown open to visitors throughout the whole week. A very considerable number of people took advantage of the opportunity of inspecting the plant and processes for the manufacture of the company's "Prescot" paper-insulated cables.

Belgian Tariff Reductions.—Under a convention with Germany, the Belgian authorities have reduced the import duties on electrical carbons and electric irons weighing less than 10 kg. each. Great Britain also participates in these reductions with other countries entitled to "most-favoured-nation" treatment.

Searchlight Vehicles for Czecho-Slovakia.—It is reported in the financial Press that Messrs. Tilling-Stevens Motors have recently completed an order for the Government of Czecho-Slovakia for searchlight vehicles.

Canadian Electric Power Report.—H.M. Trade Commissioner at Toronto (Mr. G. F. Braddock) has forwarded to the Department of Overseas Trade a copy of the "Statement and Engineering Report by the Hydro-Electric Power Commission of Ontario," submitted to the International Joint Commission respecting the proposal to develop the St. Lawrence River. This is available for loan to British firms interested in order of application to the Department of Overseas Trade (Room 52), 35, Old Queen Street, London, S.W.1. Copies may be purchased from the Commission at $7.50 per copy.

Trade Announcements.—MESSRS. L. MCMICHAEL, LTD., have opened new head offices at Wexham Road, Slough. The London offices, Hastings House, Norfolk Street, Strand, W.C., will continue as wholesale showrooms.

The telephone number of the CHARING CROSS ELECTRICITY SUPPLY CO., LTD., 60, St. Martin's Lane, W.C.2, is now "Gerrard 9134 (4 lines)."

MESSRS. R.I., LIMITED, have appointed Mr. Michael Black, 11, West Nile Street, Glasgow (telephone numbers 917 and 918; telegraphic address "Faneeka, Glasgow") their representative for the whole of Scotland. He will hold a large stock of all "R.I." components and sets, and a special showroom has been opened for trade purposes.

THE ILFORD ELECTRICAL CO. have commenced business at 36, The Hill, Ilford. Catalogues, &c., are asked for.

MESSRS. R. A. ROTHERMEL, LTD., 24 and 26, Maddox Street, Regent Street, London, W.1, announce that owing to increased business the radio section has been taken over by the Rothermel Corporation of Great Britain, Ltd.

MESSRS. CARRINGTON & BUTTON, electrical engineers, 44, High Street, Crewe, have opened a new showroom for electrical fittings, glassware, &c.

Catalogues and Lists.—MESSRS. RANSOMES, SIMS AND JEFFERIES, LTD., Orwell Works, Ipswich.—An illustrated catalogue describing various designs of "Orwell" electric industrial trucks.

METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester,.—Leaflet 293/1-1, describing truck type switchgear; 301/8-1, dealing with sheet steel cubicle switchboards. Illustrated.

MESSRS. FREDK. BRABY & CO., LTD., Petershill Road, Glasgow.—40-page catalogue of structural steelwork; 16-page publication showing steel storage bins.

EAST LONDON RUBBER CO., LTD., 29-33, Great Eastern Street, London, E.C.2.—Catalogue of over 200 pages prepared on the loose-leaf system, allowing for additions to be made, detailing, illustrating and pricing a very wide range of wireless sets and parts for the trade.

MESSRS. WATSON & SONS (ELECTRO-MEDICAL), LTD., Sunic House, Parker Street, Kingsway, London, W.C.2.—12-page pamphlet, describing and illustrating apparatus for the high tension testing of cables and overhead lines by d.c. Illustrated booklet describing hot-cathode valve apparatus for h.p. cable testing with d.c. Illustrated and priced 30-page bulletin No. 73 (supplementing catalogue, Part III, Section 5), describing lamps and apparatus for ultra-violet or artificial sunlight treatment.

SIEMENS & ENGLISH ELECTRIC LAMP CO., LTD., 38-39, Upper Thames Street, London, E.C.4.—Two small and effective showcards, advertising Siemens-Xcel electric irons and vacuum cleaners. A catalogue of ceiling and bowl fittings, and booklet of "Silvalux" colour sprayed enamelled lamps. Illustrated and priced. The booklet also contains useful information for wireless users.

THE MARCONIPHONE CO., LTD., Marconi House, Strand, London, W.C.2.—A number of new publications, each of which deals with one of the following lines:—Sterling loud speakers and amplifiers; Sterling receiving sets and accessories; Marconiphone auto series parallel variometer; "Ideal" transformers; Sterling Super "Invicta" battery; Marconiphone receivers and amplifiers; Marconi valves and "Die-cast" variable condensers.

MESSRS. GARNETT, WHITELEY & CO., LTD., Lotus Works, Broadgreen Road, Liverpool.—Priced leaflet of the Lotus vernier coil holders. Show-card in preparation.

AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., Liverpool.—16-page list, giving illustrated particulars and prices of the "Xcel" electric domestic appliances. These products are being handled by Messrs. Siemens & English Electric Lamp Co., Ltd., who are supplying quantities of over-printed pamphlets when desired.

MESSRS. MCKECHNIE BROS., LTD., Rotton Park Street, Birmingham.—New edition of their catalogue (24 pp.) of extruded rods, sections, stampings, chill cast bars, and ingots in non-ferrous alloys. Four pages of handy tables.

Z ELECTRIC LAMP & SUPPLIES CO., LTD., 73, Newman Street, Oxford Street, London, W.1.—Compact set of pocket tables of prices of various brands and types of lamps manufactured by members of E.L.M.A.

THE BENJAMIN ELECTRIC, LTD., Brantwood Works, Tariff Road, Tottenham, London, N.17.—Illustrated particulars of their new "Biflector" fittings, shop window fittings, hand lamps, wireless switches, &c., and views of the works are given in the company's September Bulletin.

ATELIERS DE CONSTRUCTIONS ELECTRIQUES DE CHARLEROI, Charleroi.—October pamphlet, showing motors and dynamos in stock at Charleroi.

WESTINGHOUSE ELECTRIC & MANUFACTURING CO., East Pittsburgh, Pa., U.S.A.—A booklet describing electric railway material for mines. Illustrated. Also leaflets showing Westinghouse furnace elements, single retort underfeed stokers, measuring instruments, electrical equipment for paper machine drive, type "KD" generator and feeder panels, and motors for Baldwin-Westinghouse mine locomotives.

Messrs. Rose Bros. Electrical Co., Ltd., 25, Milton Street, London, E.C.2.—Priced catalogue of various electrical accessories. Illustrated.

Messrs. C. H. Parsons, Ltd., Britannia Works, Tyseley, Birmingham.—An illustrated and priced list of "Britmac" switches and lampholders.

Automatic and Electric Furnaces, Ltd., Elecfurn Works, 173-175, Farringdon Road, E.C.1.—A booklet containing illustrations, details, and prices of Wild-Barfield electrically-heated industrial ovens.

Superlamp, Ltd., 92-94, Paul Street, Great Eastern Street, E.C.2.—A net trade price list of wireless accessories.

Bowen Instrument Co., 9, Newton Road, Leeds.—An illustrated catalogue and price list describing the "Pyro" radiation pyrometer.

The Sun Electrical Co., Ltd., 118 and 120, Charing Cross Road, W.C.2.—An illustrated and priced catalogue of electric fires of various makes, including "Sunco" fires and radiators.

Messrs. Philips Lamps, Ltd., 60, Wilson Street, Finsbury Square, E.C.2.—Two specimens of a coloured blotter depicting the "Argenta" lamp and girl.

The British Thomson-Houston Co., Ltd., Rugby.—A catalogue showing various designs of "Mazda" electric lamps, also a leaflet describing "Mazda" electric decoration lamp outfits. Illustrated and priced.

The London Electrical Co., 1, Sherborne Lane, King William Street, E.C.4.—A net trade price list of electrical materials and accessories, also an illustrated and priced catalogue of electric fires and other domestic appliances.

Messrs. Johnson & Phillips, Ltd., Charlton, S.E.7.—An illustrated booklet, describing various designs of a.c. and d.c. switchboards.

Messrs. Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.4.—An illustrated catalogue describing the C.S.W. type of network boxes.

Messrs. Siemens Brothers & Co., Ltd., Woolwich, London, S.E.18.—36-page catalogue 595, revised edition, particularising and showing reduced prices of wireless sets and accessories. The new type large capacity radio batteries are now included and fully described.

The Arora Co., Rosebery Street, Loughborough.—An illustrated and priced folder describing "Arora" cooking apparatus.

Messrs. Joseph Adamson & Co., Hyde, Cheshire.—Pamphlet containing well illustrated matter relating to their horizontal flame tube type waste heat boilers.

Electric Fires, Ltd.—Booklet No. 44. An illustrated catalogue and price list of the "Heatrae" products.

Metro-Vick Supplies, Ltd.—Envelope series No. 4150/9. Deals with several new designs of electric fires. Illustrated and priced.

M. P. Dieny, 20 and 21, Laurence Pountney Lane, Cannon Street, London, E.C.4.—Illustrated list describing the "Wyss" belt-tightening device made by Wyss & Cie, Seloncourt, France.

Bankruptcy Proceedings.—Cyril Bertram Maurice, 14-15, Windsor House, Victoria Street, London, S.W., electrical merchant.—The public examination of this debtor was held on October 6th, before Mr. Registrar Francke at the London Bankruptcy Court, the accounts showing liabilities £745 and assets "nil." Replying to the Official Receiver, debtor said that when he was demobilised in 1919 he commenced business in partnership with another person as electrical merchants and factors at 59-61, New Oxford Street, under the style of Catchpole & Maurice. The assets and liabilities of that business were taken over in June, 1920, by a company then formed to acquire it; as one of the vendors witness received £1,000 in shares, and he acted as director until March, 1924, when the company (Catchpole & Morris, Ltd.), was wound up, his shares being then of no value. Witness next started business as an import merchant at 14-15, Windsor House, where he traded until his failure, which he attributed to his inability to obtain electrical supplies from abroad to meet orders; to loss of £300 in a bookmaking business, which he carried on from May, 1924, to January, 1925, and to law costs. The debt of the petitioning creditors (The C.A.T. Cable Co., Ltd.), was in respect of cables supplied in part execution of his order and for which he was unable to pay when called upon to do so. The examination was concluded.

W. C. Rhodes (L. J. Palmer & Co.), electrical engineer and contractor, 141, Newspaper House, Corporation Street, Birmingham.—Receiving order made October 1st on debtor's own petition.

First meeting, October 19th, at the Official Receiver's office, 191, Corporation Street, Birmingham; public examination, November 11th, at the Court House, Birmingham.

J. R. Pattison, electrical supplies factor, 15, Goldsmith Street, Nottingham.—Last day for proofs for dividend, October 24th. Trustee, Mr. L. A. West, Official Receiver, 4, Castle Place, Nottingham.

L. Backhouse, C. H. Thornton, and S. Evans (Arc Electrical Co.), electrical and wireless suppliers, Palatine Buildings, Victoria Street, Manchester.—Trustee, Mr. A. T. Eaves, 15, Fountain Street, Manchester; released, September 17th.

T. A. Wickham, electrical engineer, Snaresbrook, Station Road, New Milton, Southampton.—Receiving order made October 1st, on debtor's own petition.

H. Fildes, electrical engineer's superintendent, Durham House, 108, Monton Road, Eccles.—First and final dividend of 20s. in the £ and 4 per cent. interest, payable at the Official Receiver's offices, Byrom Street, Manchester.

W. R. J. White (W. R. White), electrical agent, Golden House, 29, Great Pulteney Street, W.—Application for discharge to be heard October 27th at Carey Street, W.C.

G. J. C. Thorne and A. H. Thorne (Lawrance Electrical Trading Co.), electrical engineers, late of 159, High Street, Notting Hill Gate, W.—Last day for proofs for dividend, October 27th. Trustee, Mr. D. Williams, Official Receiver, Carey Street, W.C.

S. H. Bardwell (Bennett, Bardwell & Co.), electrical engineer, 22, Church Street, Basingstoke.—First meeting, October 16th, at the Official Receiver's office, Midland Bank Chambers, High Street, Southampton. Public examination, November 10th, at the Castle, Winchester.

H. McClelland, wireless apparatus merchant, 12, Leigham Avenue, Streatham Hill, S.W., and late of 48, Strand, W.C.—Receiving order made October 6th, on creditors' petition.

Company Liquidations.—Connolly Bros., Ltd. (old company).—Liquidator, Mr. I. M. Henderson, 2, Moorgate Buildings, E.C.2, released September 2nd.

Carter & Mitchell, Ltd.—Meeting of creditors at the office of the liquidator, Mr. C. Latham, 78, New Oxford Street, W.C., on October 22nd. Particulars of claims to the liquidator by November 23rd.

Dissolution of Partnership.—Wood & Tennant, electrical engineers, London Road, Alderley Edge, Chester.—Messrs. F. Wood and E. Tennant have dissolved partnership. Mr. Wood will attend to debts.

Private Arrangements.—W. D. Edwards and S. Fordyce, trading as Edwards & Fordyce, electrical and wireless dealers, 302, Upper Richmond Road, East Sheen, S.W.14.—The creditors interested herein were called together on October 5th at the offices of Messrs. Wilkinson, Howitt & Co., solicitors, 14, Bedford Street, W.C., when Mr. Littlewood reported that the liabilities amounted to £1,036, and the assets consisted of stock £520, valued at £200, and book debts £291, estimated to produce £200. It would appear that the sheriff was in possession and was entitled to sell almost immediately. Mr. Littlewood said that he was instructed to put forward an offer of 10s. in the £ in cash. Replying to Mr. W. Baker, of the Wholesale Traders' Association, Mr. Littlewood said that the business was commenced about five years ago with a capital of £500. There was an amount of £358 due to the bank but that claim had been guaranteed to the extent of £300. The drawings for the year ended December 31st, 1924, were £544. At that date creditors' claims amounted to £1,383. It was also stated that the stock consisted mostly of wireless accessories. After some discussion it was decided to accept the proposed composition of 10s. in the £, payable forthwith, and a small committee was appointed, consisting of Mr. W. A. H. Osborne, representing creditors, Mr. E. H. Hawkins, representing creditors, and Mr. Smith (Foster Engineering Co.). The following are creditors:—

	£		£
British Thomson-Houston Co., Ltd.	64	Pope's Electric Co.	51
Falk, Stadelmann & Co., Ltd.	70	Foster Engineering Co.	76
Edison Swan Electric Co., Ltd.	31	Sun Electrical Co.	20
Jones, F. E.	77	Berry's Electric Co.	32
Spicer Bros.	21	New Syneigi Co.	31
Z. Electric Co.	127	Edwards, C. A.	300
Brompton Accessories Co. ...	20	Bankers	58
General Electric Co., Ltd. ...	28	Portable Electric Light Co. ...	20

Unemployment.—The number of unemployed recorded on October 5th was 1,297,600; this was 38,555 fewer than the previous week, but 82,025 more than a year ago.

Transport Costs.—The Wholesale Produce Merchants' Association has invited Mr. C. Holmes Waghorn, A.M.Inst.C.E., to read a paper entitled "Increasing Profits by Reducing Transport Costs—Improvements in Delivery Systems for Provision Merchants." It will be delivered at 2.30 p.m. on October 28th, at the London Provision Exchange, Hibernia Chambers, London Bridge. The speaker, while dealing with all kinds of road transportation, proposes to refer especially to electric battery vehicles, traffic congestion, and loading dock and garage design.

Our Foreign Trade.—September Figures.—The Board of Trade returns for September show the following values of electrical imports and exports:—

	September, 1925.	Inc. or dec.	9 months 1925.
Imports.—			
Electrical goods and apparatus	336,091	+ 7,696	+ 815,995
Machinery	857,750	+ 58,398	+1,189,867
(Electrical machinery) ...	97,202	+ 14,118	+ 51,378
Exports.—			
Electrical goods and apparatus	1,159,974	+307,295	+1,730,826
Machinery	3,959,151	+345,898	+3,848,691
(Electrical machinery) ...	376,269	− 46,363	+ 557,642
Re-exports.—			
Electrical goods and apparatus	11,424	− 4,493	+ 59,901
Machinery	88,301	− 12,435	+ 214,685
(Electrical machinery) ...	4,372	+ 56	− 21,641

United States Tariffs.—The U.S. Customs authorities have lately given a decision that "magnetos, dynamos, starters, switches, and parts of said articles comprising the ignition and lighting system for use as parts of automobiles" are dutiable at 25 per cent. as "parts of automobiles finished or unfinished" under No. 369 of the tariff.

For Sale.—Great Yarmouth Corporation Electricity Department invites offers for surplus generating plant owing to the change of system of supply. Mr. H. J. Shaw will sell by auction on October 27th, at 85, Newington Causeway, S.E., the stock of an electrical and wireless goods factor. Manchester Corporation Electricity Committee has for disposal 40 weldless-steel lamp columns and 48 11-amp. magazine flame arc lamps with winches, &c. (See our advertisement pages to-day.)

Japanese Electrical Notes.—Our correspondent says it is reported that the Toso Tetsudo K.K., whose head office is at Aoshima-machi, Shizuoka-ken, has made healthy progress since its establishment and it plans electrifying its whole railway line shortly by doubling its capital of 1,200,000 yen. The project to organise the Seikai Electric Co. is making steady progress under Mr. T. Miyayama, M.P., and Mr. K. Tsuruya, a leading resident of Goshokawahara-machi, Aomori-ken, together with twelve others. The capital will amount to 600,000 yen, of which 375,000 yen will first be paid up. The company will be organised in about December. There will be two hydro-electric power stations, one with 250 kW and another with 150 kW, the completion of which is expected in 1926. With reference to a trackless electric railway project between Yamaguchi and Yuda, Kyushu, it is understood that it is desired to carry it out by the date of an exhibition to be held in the town of Yamaguchi, and an order for motor-cars has been issued to the Hidachi Works. A letter from the same works to Mr. Kasuya, the director of the Electric Bureau of the Yamaguchi Prefectural Office, says that it has been decided to equip the cars with a.c. 3-phase induction motors instead of d.c., the latter being unsuccessful.

Application has been made to the Railway Department by the Seidaiji Light Railway Co. for permission to extend its line for 32 miles, the estimated cost of construction being 4,300,000 yen.

During May, 1925, the following power stations were granted charter :—

Location.	Company.	Name of power station.	Steam or water power.	Electric power. (kW.)
Cifu	Oshirakawa Denryoku K.K.	Hirase ...	Water power	7,004
Cifu	Ibi-gawa Denki K.K.	Nishihira ...	,, ,,	3,700
Cifu	Hozu-gawa Denki K.K.	Hizaka ...	,, ,,	23
Nagano ...	Nagano Dento K.K.	Shigaki ..	,, ,,	1,180
Nagano ...	Nagano Dento K.K.	Sawajiri ..	,, ,,	1,720
Ishikawa ...	Taishoji-gawa Suiden K.K.	Kutani ...	,, ,,	1,300
Shimane ...	Oki-Denki K.K. .	Second ...	Gas power ...	100
Kagawa ...	Shikoku Suiryoku Denki K.K	Desi ...	Water power	6,080
Kagawa ...	Seisan Seiki K.K.	Awashima ...	Gas power ..	10
Niyasaki ...	Miyakonojo Denki K.K.	1st Kirishima	Water power	440
Kagoshima	Yakujima Denki K.K.	Takenogawa	,, ,,	169
Miyagi ...	Kisenuma Denki K.K.	Kisenuma ...	Gas power ..	110
Miyagi ...	Miyagi Prefecture	Onikubi ..	Water power	950
Fukushima	Tobu Denryoku K.K.	Uyeda ...	Steam power	16,000
Yamagata ...	Sukata-machi ...	Sakata-machi	,, ,,	500
Akita ...	Akita Suiryoku Denki K.K.	Tsuchizaki ...	,, ,,	1,000
Hokkaido ...	Yamato Mokuzai K.K.	Wakanai ...	Gas power ..	200
Hokkaido ...	Hokkaido Dento K.K.	Sogyu ...	Water power	3,270

German Failures.—The *Financial Times* states that the number of bankruptcies in Germany during September increased by 171 to 896. The total number of bankruptcies in the third quarter of this year amounted to 2,409, against 2,786 in the corresponding period of last year.

New Telephone Works.—The financial Press reports that in a recent speech Sir Max Muspratt announced that the Automatic Telephone Manufacturing Co., Ltd., which now employs 3,000 to 4,000 people, was about to build additional works in Liverpool.

Lead.—Messrs. James Forster & Co. reported on October 10th that in this country consumption was decreasing slightly, but there was still a shortage of metal in spite of recent imports of lead from the Continent; it was, however, easy to see what course prices would take should the settlement of the shipping strike coincide with freer offerings of lead from America.

Russia to Import Miners' Electric Lamps.—A Reuter Trade Service dispatch from Moscow states that the Yugostal Trust has applied to the Glavmetall for permission to import 9,000 miners' electric lamps for use at the Novo-Smolianinov mines.

Bankruptcy Order Annulled.—H. FILDES, electrical engineer's superintendent, Durham House, 108, Monton Road, Eccles.—Adjudication and receiving order of July, 1925, annulled October 6th, 1925; debts, interest, costs, charges and expenses of the bankruptcy having been paid in full.

Commercial Electrical Travellers' Concert. — The Bohemian concert of the Electrical Trades Commercial Travellers' Association, held on Saturday last at the Manchester Hotel, E.C., was very well attended. During the evening Mr. A. E. Joyce, the chairman, spoke upon the objects and achievements of the Association, and referred to the large amount of good work already done by the Association in spite of its tender age. The vice-chairman, Mr. A. S. Marks, also spoke upon the Association, and gave a list of further social functions arranged by the Entertainment Committee. It was felt that the successful nature of the evening augured well for the further events arranged by the indefatigable entertainments' secretaries, Mr. L. Moir and Mr. J. M. Woolnough, and their band of willing helpers.

Book Notices.—We have received a copy of the first part of "Modern Advertising" (London: Sir Isaac Pitman and Sons, Ltd. 2s.), which is to be completed in 20 fortnightly parts. It contains a number of articles by leading exponents of the business and practice of advertising and publicity, whether through the Press, on the sky, by means of illuminated signs, posters, films, or in shop windows. The preparation of "copy," the lay-out of advertisements, and the amount of a business firm's advertising budget are among the matters discussed in other contributions. In view of the growing importance of good advertising in the trade Press as an aid to salesmanship, the publication should be useful to the increasing number of men who are specialising in the subject.

"The Electrical Educator."—We have received copies of the first two parts of the above work, which is being published by Sir Isaac Pitman & Sons, Ltd., in 30 fortnightly parts (at 1s. 3d. each). Part I was issued on October 3rd. The prospectus of the work covers a wide field of electrical engineering ranging from the elementary principles of electricity and magnetism to advanced theory and practice, arranged in lessons so that each part covers many electrical subjects. Many eminent engineers are contributing. Among them are Col. R. E. Crompton, C.B., M.I.E.E., Sir Charles Bright, F.R.S.E., and Professors Miles Walker, D.Sc., and W. Cramp, D.Sc. The opening article in Part I, "The Education of Electrical Engineers," by Professor Walker, is of particular general interest. Another interesting contribution is "Electricity and Magnetism," by Mr. C. H. Yeaman, City Electrical Engineer, Stoke-on-Trent, in which appears an ingeniously arranged chart showing the relations of the various branches of human knowledge. Part II contains another article of general interest, "The Miner and the Super Power Station," by Mr. Frank Hodges, Secretary of the Miners' International Federation.

"The Restoration of Belgian Public Finance," by A. E. Janssen. London: University of London Press, Ltd. Price 1s. net.

"Report of the Committee of the Privy Council for Scientific and Industrial Research for 1924-25."—London: H.M. Stationery Office. Price 3s. net.

"*Proceedings* of the American Society of Civil Engineers."—Vol. LI, No. 8, October, 1925.

"The Technology Reports of the Tohoku Imperial University," Sendai, Japan.—Vol. V, No. 3, 1925.

"The *Journal* of the South African Institution of Engineers."—Vol. XXIV, No. 2, September, 1925. Price, 2s.

"The *Transactions* of the South African Institution of Electrical Engineers."—Vol. XVII, Part 6, August, 1925. Price, 2s.

The Best-lighted Window.—The first prize awarded by the Bradford Electrical Contractors' Association for the best-lighted window in the recent Bradford Shopping Week has been given to Messrs. Rushworth, Ltd., fancy dealers. The lighting specification was prepared by Messrs. Guy & Laycock, Ltd., of Huddersfield.

New French Company.—La Société Pathe Radio is the name of a new company which has been lately formed in Paris (30, Boulevard des Italiens), with a capital of 1,200,000 francs, to manufacture radio apparatus.

Lighting and Power Notes.

Barking.—ELECTRICITY IN BULK.—The Urban District Council has decided to cease generating its own electricity supply and to take a bulk supply from the County of London Electric Supply Co., Ltd. The cost of a new sub-station with the necessary equipment is estimated at £24,157.

Barrow. — NEW HYDRO-ELECTRIC STATION. — The Town Council on October 5th approved the scheme, subject to the necessary agreements being entered into, for a hydro-electric power station on the River Leven, at Backbarrow, and it was decided to make application to the Electricity Commissioners for their approval to the establishment of the proposed station and for sanction to the borrowing of £90,000, made up as follows:—Works at Backbarrow, £78,000; transmission line, £12,000. It was further resolved to recommend that application be made to the Unemployment Grants Committee for a grant towards the cost of the scheme.

Barry.—SPECIAL ORDER.—The Urban District Council has applied for a Special Order authorising it to supply electricity in the district. It is proposed to obtain a supply from the South Wales Electric Power Distribution Co.

Beckenham.—NEW ELECTRICITY CHARGES.—The Urban District Council proposes to introduce the following revised electricity charges:—Present tariff: An initial charge based on the kW connected, all electricity used being charged at 2d. per kWh. Revised rate: A charge of 12½ per cent. on the rateable value of premises for the first £75, and 6 per cent. on values above £75, plus 2d. per kWh in houses where electricity is not used for cooking, and 1½d. per kWh where cookers are installed. The Electricity Committee has decided to make an inclusive charge of £5 10s. per annum for 500-W lamps used for outside shop lighting.

Bradford.—Electricity Extensions.—The Corporation Estimates Sub-Committee has approved of the Electricity Committee recommendations for the erection of transformer chamber buildings at Norman Lane (Eccleshill) and Harrogate Road (Apperley Bridge), and the provision of new e.h.p. cables from the Valley Road generating station to the Sunbridge Road sub-station, at an estimated cost for cables of £4,300.

Canada.—Hydro-Electrical Development.—According to *Power*, a report recently issued by the Ontario Hydro-Electric Power Commission gives details of three alternative proposals for the improvement of the international stretch of the St. Lawrence River for navigation and for developing electrical energy of 1,600,000 h.p. One project contemplates all the power being developed at the foot of the Long Sault, another the generation of part of the power near Morrisburg, Ontario, and the third is similar to the second, but with the upper power house situated at Crysler Island. The Commission estimates that it will be necessary to provide new sources of electric power amounting to more than 400,000 h.p. by 1931, which would be increased to over 1,100,000 h.p. in 1936, and states that if authority were immediately granted to develop the international portion of the St. Lawrence by 1935 or 1936, the whole of Ontario's share of the St. Lawrence River power would probably be absorbed by the Ontario markets alone.

Cheltenham.—Loan.—The Town Council is applying for sanction to the borrowing of £5,000 for mains and services.

Chesterfield.—Electricity for Small Houses.—Owing to the increased popularity of the "hired wiring" scheme for small houses, the Corporation is applying for sanction to a further loan of £4,548 to cover the cost of the wiring of 621 additional houses.

Extension of Supply.—Mains are to be extended along Holymoorside Road to Greendale Avenue at an estimated cost of £354, and a supply to the whole of the village of Holymoorside is to be considered at the next meeting of the Electricity Committee.

Price Reductions.—The following reductions have been made in the charges for electricity:—Lighting: From 5½d. to 4¾d. per kWh, with a discount of 5 per cent. for prompt payment. Combined rate to large power consumers: The "unit" charge from .4d. to .380d., with discounts varying from 10 per cent. to 22½ per cent.

Colne.—Electricity in Bulk.—The Town Council has received a request for a supply of electricity to Earby, and proposes to give a bulk supply, subject to satisfactory terms being arranged.

Continental.—The Tyrol.—A telegram from Innsbruck states that German financiers are granting a loan to the Tyrol of ten million schillings, which will be used, among other purposes, for the development of water power.—*Reuter* (Vienna).

Switzerland.—The report on the working of the Basle municipal electricity stations during 1924, states that the original plant, which had a capacity of 8,230 kW, is now only used for emergency purposes. The capacity of the Basle generating stations has been increased to 36,000 kW, while during the past ten years the demand for lighting and household purposes was advanced from 2½ to 12.4 million kWh, and for power purposes from 21.8 to 37.6 million kWh per annum.

Austria.—The Stern-Hafferl Gesellschaft, of Gmunden, has recently established a new hydro-electric generating station at Steeg on Lake Hallstatter for the supply of the power required for the operation of the Salzkammergut section of the Austrian State railways. The electrical plant, which was supplied by the Austrian Siemens-Schuckert Co., of Vienna, comprises six alternators, driven by Pelton-type turbines.

Germany.—With the support of the Thuringian Government, a company has recently been formed to utilise the water power of the River Saale between the Bavarian frontier near Hirschberg and its junction with the Lockwitz. It is proposed to construct a dam which will enable the water of the river along a distance of about 18 miles to be utilised, and to establish a hydro-electric station having an annual output of approximately 60 million kWh.

At a recent meeting of the Baden Government authorities, the Finance Minister gave some interesting particulars of the progress of the Baden Provincial Electricity Supply Co., which is now suppplying electricity to 500 small towns and villages. The Murgwerk power station, completed in 1918, has an output of 67 million kWh per year, a total which will be brought up to 123 million kWh by the Schwarzenbach station, which is rapidly approaching completion. In order to provide ample supplies in excessively dry periods, the Baden Co. is establishing a 100,000-V transmission line to obtain electricity from Swiss power stations as far south as the St. Gotthard, and in the north is linking up with the steam generating station of the Rhenish-Westphalian Co.

Doncaster.—Extension of Supply.—The Corporation Electricity Committee has received an application from the Bentley-with-Arksey Urban District Council for a supply of electricity to 94 houses to be built by the latter Council on the Bentley House Farm estate, and has decided to provide a supply. Subject to borrowing powers being secured, the Committee has agreed to lay a new e.h.p. feeder cable to Bentley, at an estimated cost of £3,300.

Edinburgh.—Year's Working.—We have received from Mr. E. Seddon, engineer and manager of the Corporation electricity undertaking, a copy of his report, together with the statement of accounts for the year ended May 15th last. The total income amounted to £460,454, and working expenses were £243,286, leaving a gross surplus of £217,168. The figures for the preceding year were: Income, £429,817; working expenses, £220,100; gross profit, £209,717. Interest absorbed £96,992, contribution to liquidation of debt for capital expenditure £106,516, and income tax £7,485, leaving a balance of £6,175. The previous year's working resulted in a surplus of £17,687. The capital expenditure during the year amounted to £216 346, the bulk of which was spent on machinery and plant for the Portobello station, and for mains and cables. The sales of electrical energy increased from 52,781,659 to 65,638,593 kWh. During the year the Electricity Committee considered a number of extensions to generating and sub-station machinery and recommended the following additions:—One 10,000-kW turbo-alternator; two 65,000-lb. boilers; one circulating and one boiler feed pump; one 500-kW motor converter for Gorgie sub-station; sub-stations for the supply of a.c. at Davidson's Mains, Murrayfield, Inverleith, and Blackhall; extensions to cable system linking up these sub-stations.

Fleetwood.—Hire of Domestic Apparatus.—The Town Council is applying for sanction to borrow £5,000 for the purchase of electric heating and cooking apparatus to be let out on hire.

Hull.—Loans.—The Electricity Committee is applying for sanction to loans of £188,000 for mains and services, and £79,000 for sub-stations.

Irish Free State.—Edenderry (King's Co.).—The Ministry of Industry and Commerce has refused to sanction a scheme proposed for the public and private supply of electricity for the town, stating that facilities for a bulk supply would be available from the Shannon scheme in a few years' time. A local arrangement for public lighting could meanwhile be made.

Liverpool.—Progress of Extensions.—Mr. H. Dickinson, city electrical engineer, states that rapid progress is being made with the extension of the Lister Drive power station, and that the new 25,000-kW set will probably be put into commission early in the new year. The work of erecting two new boilers is well advanced, the new cooling tower is nearing completion, and the switchgear is in position. When the new set is completed, the station will have a capacity of 100,000 kW, and there is accommodation for plant of a further 100,000 kW. Since opening the new electricity showrooms in Whitechapel, 220 electric cookers have been let out on hire, bringing the total number now on hire up to about 1,000.

London. — St. Marylebone. — In connection with the Borough Council's scheme for late shop window lighting, we are informed that Venner time switches will be employed.

Electricity Charges.—The City Corporation is to consider what steps can be taken to obtain cheaper electricity for the City. At a recent meeting of the Corporation it was stated that the rate was 6d. per kWh maximum, with a secondary charge of 4d., as compared with 4d. and 1d. respectively in Stepney, Bethnal Green, and St. Pancras.

Loughborough.—Wiring of Small Houses.—The Town Council is considering an assisted wiring scheme in connection with the new Council houses, under which the cost of installation is estimated at £17 9s. 9d. per house, and the cost of supplying 100 kWh at 15s. 2d. The annual revenue is estimated at £3 10s. from the consumption of 100 kWh at 8½d., this including 6d. per kWh for electricity, 1d. per kWh for meter rent, and 1½d. per kWh for hire-purchase wiring, the latter charge to cease after the consumption of 12,000 kWh. The consumer is to pay £7 10s. towards the cost of installation and the Corporation the balance.

Ludlow.—Purchase of Undertaking Abandoned.—At a recent meeting of the Town Council a recommendation of the Finance Committee that no further action should be taken with regard to the proposal to acquire the local electricity undertaking was adopted. The sum demanded by the company was £10,000.

Lytham-St. Annes.—New Electricity Charge.—The Electricity Committee has approved the following new domestic electricity tariff:—20 per cent. of the annual rateable value, plus 1d. per kWh for all electricity consumed.

Maidstone.—Loans.—The Town Council has applied for sanction to loans of £7,500 for services and £1,000 for the purchase of apparatus to be let out on hire.

Melksham.—Inquiry.—Sir Frank Marwood held an inquiry, on behalf of the Minister of Transport, at the Town Hall on October 7th into objections raised by Col. Forster and Mr. H. H. Parry to the proposal of the West Wilts. Electric Light and Power Co. to erect poles on their land in connection with the scheme for the supply of electricity to a large area of Wiltshire. Mr. G. Ferris, for Mr. Parry, stated that the erection of poles would reduce the value of his property by 30 per cent., and he maintained that the lines should be laid underground. Mr. Long, for Col. Forster, complained that the payment of 1s. for the erection of each pole was insufficient, and if the poles were erected, a reasonable rate should be paid. He also suggested that the company should lay the lines underground. Mr. White, who represented the company, stated that a supply could not be given to Corsham until the transmission line was carried over Mr. Parry's land, and it was necessary to erect lines across Col. Forster's fields to complete the supply for Holt. The cost of underground lines would be at least three times as much as that for overhead lines, with a corresponding increase in the cost of electricity to consumers. A bulk supply was obtained from Bath Corporation to supply

the district, and the Corporation had installed plant for this purpose at a cost of £12,000. The Ministry will give its decision in due course.

Moreton.—ELECTRICITY SUPPLY.—The local Council has decided that in view of the high price per kWh and the heavy increase in the rates which would be imposed by the electricity scheme of the Wirral Rural Council, the latter be requested to cease any further expenditure on the scheme until the Electricity Commissioners have considered the complaint raised by the ratepayers of the district. It was further resolved that the Council should send a deputation to Wallasey to inquire into the supply of electricity to Moreton by that authority.

New Zealand.—HYDRO-ELECTRICAL DEVELOPMENT.—According to the *Electrical Engineer of Australia and New Zealand*, the South Canterbury Power Board has requested the Public Works Department to send officers to confer with members of the Board and of the Tekapo League on the question of the future power supplies of the district. At present the Board is receiving a bulk supply from Lake Coleridge, but it is considered that immediate steps should be taken to develop hydro-electric power from Lake Tekapo in order to supplement the supply. The Public Works Department is preparing a report on the scheme. It is estimated that at a head of 900 ft. the lake would yield 300,000 kW at a 50 per cent. load factor.

The Public Works Department is taking immediate steps towards the development of a large hydro-electric scheme at Lake Waikaremoana. An agreement has been arrived at with the Poverty Bay Power Board which requires a supply of energy, and the Department has undertaken to have an electricity supply available within three years. The immediate installation contemplated involves plant with a capacity of 40,000 h.p., at an estimated cost of £2,600,000. The site is capable of development up to 130,000 h.p. Pending the completion of the hydro-electric plant, the Poverty Bay Power Board intends to take over and operate the steam plant of the Gisborne Borough Council. The bulk supply from Waikaremoana will be obtained by duplicate transmission lines erected by the Public Works Department.

Northern Ireland.—RATHFRILAND (CO. DOWN).—The Newry Rural District Council has obtained permission to erect overhead lines from Newry to Rathfriland in connection with the scheme for an electric lighting installation in the latter town.

ARMAGH.—The Town Council has approved a scheme submitted by Mr. P. A. Spalding, electrical engineer, Dundalk, for an electricity supply for the town.

Oldham.—LOAN SANCTIONED.—The Corporation has received sanction to the borrowing of £65,000 for mains, transformers and switchgear.

Preston-Blackpool-Lytham-St. Annes.—BULK SUPPLY.—An agreement has been entered into between the Preston and Blackpool Corporations respecting a bulk supply of electricity to Blackpool from the new Ribble power station. An agreement is also being arranged for a bulk supply from Blackpool to Lytham-St. Annes Corporation.

Southport.—LOAN.—The Electricity Committee is applying for sanction to a loan of £3,000 for the purchase of electrical appliances required in connection with the new showroom shortly to be opened at the Glaciarum.

Sunderland.—PROGRESS OF EXTENSIONS.—The Electricity and Tramway Committees recently inspected the Hylton Road works of the two departments and the extensions which are being carried out at the electricity works. Two 250-lb. Vickers-Spearing boilers are in course of erection, and four Galloway boilers have recently been sold and removed and the space thus cleared will be used to install more high-pressure boilers. Four Babcock & Wilcox water-tube boilers are the only remaining low-pressure boilers and will probably be superseded. Four new water-cooling towers are being installed, also a new 10,000-kW turbo-generator, which will be completed about the end of October. A second 10,000-kW turbo-generator is expected to be ready by next July. The electricity undertaking has 56 sub-stations and 117 miles of mains, and within the next twelve months a further 60 miles of mains will be laid, this work having recently been commenced so that all the streets of the town will be lit by electricity.

Ulverston.—ELECTRICITY CHARGES.—At a recent meeting of the Urban District Council it was stated that the charge for electricity would be 9d. per kWh. The supply is being obtained in bulk from Barrow.

Tramway and Railway Notes.

Accrington.—FARES.—The Corporation is applying to the Ministry of Transport for an extension of the Order authorising it to maintain increased tramway fares, which expires on December 31st.

Argentina.—RAILWAY ELECTRIFICATION.—The Ferrocarril Central Argentino recently requested authorisation from the executive authorities to electrify its line from Retiro (Buenos Aires) to Villa Ballester and Tigre by the way of Coghlan. The length of this line is 25 miles.—*Commerce Reports.*

Continental.—HUNGARY.—The electrification of the Hungarian railways has been postponed, the question of electrification being closely connected with the utilisation of the lignite reserves in Hungary, since water power cannot be utilised to a sufficient degree. Two plans for supplying the necessary power are being considered. One is based on the lignite mines near Varpalota, and the other on the deposits in the Matra mountains. An American-Hungarian company wishes to erect in the Matra district a large central power station which would make the electrification of the Budapest-Hatvan-Miskolc railway possible, while the construction of a power station at Varpalota would provide electricity for the Budapest-Királyhida line. The plans have been submitted to the Government.—*Reuter's Trade Service* (Budapest).

SWITZERLAND.—Plans are being prepared for the electrification of the railway on the right bank of Lake Zurich. It is expected that the work will be completed by the end of 1926.

SPAIN.—A new company has recently been formed in Burgos to construct a system of electric tramways in the town and district.

Birmingham.—UNEMPLOYMENT RELIEF SCHEME.—With a view to providing work for the unemployed during the coming winter, a sub-committee has recommended to the City Council that the tramway track in parts of the town be renewed, at an estimated cost of £110,000.

Chesterfield.—RAILLESS-CAR SCHEME REJECTED.—The Town Council has rejected a resolution to apply for an Order to run railless cars along certain new routes. The Council already possess Parliamentary powers to substitute railless cars for the present railed system.

Grimsby.—RAILLESS CARS.—In connection with the tramway undertaking recently acquired by the Town Council, the rails at present in Freeman Street are to be removed and the street reconstructed at a cost of £31,670, and a railless-car service introduced on the route, at an estimated cost of £13,000.

London.—L.C.C. TRAMWAY EXTENSION.—Work has commenced on the lengthening of the tramway track at the London County Council boundary at Norbury so as to join up the track of the L.C.C. tramway and Croydon Corporation tramway, thus affording facilities for a through journey from Victoria Embankment to Purley, a distance of 13¼ miles. A through service of L.C.C. cars will be instituted during this month.

KENNINGTON TUBE PROGRESS.—A contract has been placed for the construction of crossovers and sidings at Kennington underground station, and work is to commence immediately. This station is to be linked up with Charing Cross, and 1¼ miles of tunnelling have already been excavated. It is anticipated that the tunnelling will be completed by next spring. When the scheme is completed, in addition to the present route to the City, there will be a train service to Edgware, Golder's Green, and Highgate, and eventually to Morden.

Manchester.—TRACK RENEWALS.—The City Council has decided to renew certain sections of its tramway track, at an estimated cost of £75,000.

Manchuria.—HARBIN.—According to the *Electric Railway and Tramway Journal*, a company has been organised in Harbin for the construction of a tramway in the city, at an estimated cost of $2,730,000.

United States.—RAILWAY ELECTRIFICATION.—According to the *Electric Railway Journal*, the electrical operation of the Virginian Railway was commenced on September 21st. The time previously required by steam trains was 2¼ hours from Elmore to Clark's Gap, while the electric trains cover the distance in one hour. The system is operated on the single-phase, 1,000-V system. Power is supplied from a 67,500-kW steam plant at Narrows on the New River. At present it is planned to operate electrically between Mullens, W. Va., and Princetown, Va. Plans have been prepared for extending the electrified section eastward to Roanoke, a distance of approximately 134 miles at a cost of $15,000,000. Electrical operation is expected to double the capacity of the line.

Telegraph and Telephone Notes.

Australia.—TELEGRAPH AND TELEPHONE SERVICES.—The financial results for the year ended June 30th, 1924, according to the *Electrical Engineer of Australia and New Zealand*, show that in the telegraph branch a total net loss of £188,982 was recorded, while the telephone branch made a profit of £50,677. The profit on the working of telephone exchanges was £90,257, that on the working of the Sydney-Melbourne trunk line, £15,093; that on the Adelaide-Melbourne trunk line, £6,657; and that on the Sydney-Brisbane trunk line, £4,197. On the other trunk lines a net loss of £80,489 was incurred. On non-exchange lines a total profit of £14,952 was made. During the year a commencement was made with the reconstruction of the Sydney-Melbourne telegraph line and the installation of the carrier wave system; preparations were made for installing telephone repeaters between Sydney and Melbourne; the Teletype system of printed telegraphy was introduced on the Melbourne-Bendigo circuit. Several automatic telephone exchanges were installed in the metropolitan areas, and on June 30th, 1924, 32 per cent. of the city subscribers were receiving automatic service.

New Wireless Station.—A wireless station has been opened at Wave Hill, Central Australia, about five hundred miles from Port Darwin.—*Reuter* (Melbourne).

The *Daily Telegraph* points out that this is the first step in the establishment of an inland system in remote parts of the Continent. Another station is at Camooweal, which connects the landline with the air mail. The Commonwealth operates stations which serve large areas in North Australia, and are a great boon to cattle stations and settlers generally. Previously the mail was delivered every six weeks. The cost of the two stations is £10,000, as compared with £60,000 land-line charges at 2d. per word, with a minimum of 2s. 8d. The private wireless plant at Burnett Downs, a station 171 miles from Camooweal, has proved of great value. The new stations will probably result in a network of private installations, and possibly additional Government stations.

Belgium.—New Cables.—The Belgian Post and Telegraph authorities are shortly to commence the laying of new telephone and telegraph cables between La Panne and Herbesthal, between Brussels and Lille, and between Brussels and Rosendaal.

Brazil.—New Radio Station.—A new high-power naval radio station has been opened on the Ilha do Governador, in the Bay of Rio de Janeiro. It is equipped with Telefunken apparatus and has a normal estimated range of 4,500 miles. Communication is established with naval radio stations in the United States, on the Continent of Europe, and at Panama and Puerto Rico. In addition to regular Government work, the station broadcasts weather reports and time signals.—*Reuter's Trade Service* (Rio de Janeiro).

China.—Japanese Radio Proposal.—In the hope that the interested powers will reach a tentative agreement regarding Chinese wireless questions before the opening of the Tariff Conference, Mr. Matsudaira, the Japanese Ambassador at Washington, has been instructed to enter into conversations with Mr. Kellog, the United States Secretary of State, immediately, lest propagandists should use Japanese-American differences to influence the Conference. Japan proposes that China should control and operate omni-wireless stations, guaranteeing the interested powers property rights. It is understood that China's note regarding wireless has not yet been answered, but Mr. Yoshisawa, the Japanese Minister at Peking, has been instructed to communicate with China unofficially with reference to the proposal, and also to advise her that Japan does not approve of a loan for the purchase of wireless rights. Following the conversations at Washington, the Japanese Ambassadors in London and Paris will be instructed to take up the question. Though China will probably not yet be able to carry out the proposal, Japan thinks that a temporary arrangement will be possible whereby the powers will operate until China is ready.—*Reuter* (Tokio).

Sir Charles Eliot, the British Ambassador, and Baron Shidehara, the Japanese Minister for Foreign Affairs, had a conversation on October 12th, which is stated to have been of a very satisfactory nature with regard to the Chinese wireless question. It is also understood that the Japanese Government is emphasising the importance of the powers being united on their Chinese policy, and that it has instructed the Japanese Charge d'Affaires in London to seek Mr. Austen Chamberlain's co-operation to persuade America that a practical settlement of the wireless question is more important than the insistence on legal rights, which rights Japan is prepared to forgo if others will do the same.—*Reuter* (Tokio).

Italy.—Automatic Telephony.—The last of the Government-owned telephone systems has been transferred to private hands, the purchasers being the Società Esercizo Telefoni, of Naples. It is understood that the company, while making no immediate change of installation, intends to construct suitable premises of its own and to replace gradually the present equipment by automatic switchboards and other modern apparatus. —*Reuter's Trade Service* (Milan).

Italy-Argentina Cable.—Inauguration.—The new direct Italy-Argentina telegraph cable was officially opened for traffic on October 12th at Auzio.

Paraguay.—New Radio Station.—The Government of Paraguay has decided to erect a radio station at Fuerte Olimpo. The Minister of War and Marine, Asuncion, will receive tenders for the supply of materials and tools, the cost of which must not exceed 60,000 Paraguayan paper pesos.—*Reuter's Trade Service* (Asuncion).

The Telephone Service.—New Subscribers.—European telephone returns for the past year, issued by the Post Office, show that the "telephone push" in Great Britain is now having good results. During the period reviewed, the increase in the number of telephones in this country equalled 10 per cent., as compared with Germany's increase of 6 per cent. Germany, however, with 2,385,177 telephones (or one to every 28 inhabitants), still shows a greater "telephone density" than Great Britain, which has 1,264,024 (or one to 34). Sweden has 418,303 (or one to 14), and Denmark 303,754 (or one to 10). America, it may be noted for comparison, had 16,159,550 telephones (an average of one to six), and Canada 1,083,964 (or one to eight). During the year Germany added 142,845 telephones, Great Britain 115,929, Belgium 22,139 (18 per cent. increase), and Denmark and Sweden more than 15,000 each (5½ and 4 per cent. increases respectively). It is estimated that when all the returns are in, the total increase for Europe will be more than 460,000 telephones.

Telegraph Conference.—Possible Rate Increase.—Senatore G. Marconi presided at the dinner given by the foreign wireless companies on the occasion of the eleventh International Telegraph Conference at Paris. *The Times* expects that the Conference will decide to increase the terminal and transit charges for all telegrams. It is understood that the increase will vary from 10 to 30 per cent., the countries belonging to the Telegraph Union being divided into a number of categories, entitling them to a greater or lesser increase according to their financial necessities. The British have steadily opposed any increase, and they have the moral support of the American observers, but they were overruled by the majority of the other countries which emphasised the necessity of an offset to the increased working costs. The increase will apply to Press as well as to ordinary and urgent rate messages.

United States.—Cab Proprietors' Telephone Exchange.—The Telephone Development Association has called the attention of British taxicab proprietors to the fact that the Yellow Cab Co., of Newark, New Jersey, has established a private telephone exchange in which more than twenty girls are employed answering free calls for cabs and trade inquiries. The company has also erected kiosks in various parts of the city from which anyone can order a taxicab without payment of a call fee. Telephone wires from all the cab stations of the company terminate on a private switchboard, which, when operated in conjunction with the public system, gives the company most complete arrangements for dealing efficiently with taxicab business. The principle is much the same as that which is proving so successful at Stockholm.

Venezuela.—Telegraph Service.—According to a report recently issued by the Government Telephone and Telegraph Department, there are now 240 telegraph stations in Venezuela.

Radio Notes.

Latvia.—New Stations.—The Latvian Government's monopoly on the sale of radio apparatus will be discontinued when the new broadcasting stations are opened; they were due to commence service on October 1st.

New Zealand.—Proposed New Stations.—Four new stations are to be erected in New Zealand, says the *Morning Post*, which explains that the promoters of a private company have entered into an agreement with the Government to erect four stations at Auckland, Wellington, Christchurch, and Dunedin, and to maintain an efficient service. It has been agreed that the company shall receive 25s. of the 30s. that the licences will cost.

Proposed New Station.—"5 G.B."—It is understood that the station calling itself 5 G.B., which has recently been heard by listeners, is an experimental station of the British Broadcasting Co. at Chelmsford, using 10 kilowatts and a wavelength of 400-420 metres. The tests are preliminary to any other station that may be erected to serve Essex and S.E. England, at present outside crystal range of any station.

Simultaneous Broadcasting.—Land Line Reorganisation. —The reorganisation of the land-line system for the simultaneous broadcast service will be brought into operation on November 1st, when Leeds will become the pivot controlling all the transmissions relayed between the South and the North, says *The Times*. Hitherto, land-line connections between one broadcast station and another have been operated through London, except for a small intercommunication switchboard at Glasgow for linking all Scottish stations. Separate lines have been used between London and practically all other stations, save in one or two cases, and the quality of transmission has suffered by the use of several hundreds of miles of unnecessary land-lines. From November all stations north of Leeds will be linked up by land-lines to Leeds instead of to London. Between London and Leeds four special lines have been set apart by the Post Office for the use of the B.B.C. Generally, only one will be wanted, but spares are provided for alternative programmes, control purposes, and emergency use. The arrangements at Leeds will be much more automatic than they have been from London. The chief function of Leeds as a pivotal point will be to improve the quality of all items it receives from London before they are passed on. In the near future another pivot will be installed to facilitate simultaneous broadcast arrangements between London and the West Country.

South Africa.—Johannesburg.—The Johannesburg Broadcasting Co.'s station, which works on almost the same wavelength as the London station and on a power of from 1½ to 2 kW, now has about 8,000 licence holders. A licence costs £2 5s., and the station has been in operation a little over a year. The company makes no profit, but functions for the Government.

Wave-length Agreement.—Ships' Interference.—*Reuter* is officially informed that the agreement between the British, Canadian, and United States Governments to prevent the use by ships of wavelengths of 300 and 450 metres when within 250 miles of the coast applies only to the coasts of Canada, Newfoundland, and the United States. There is no such prohibition in the case of ships when within 250 miles of the coasts of the British Isles.

Richard Alexander Chattock.

President of the Institution of Electrical Engineers.

As we mentioned in our issue of June 5th, Mr. R. A. Chattock, city electrical engineer to the Birmingham Corporation, who took up his duties on October 1st as President of the Institution of Electrical Engineers, is the first head of a municipal electricity supply undertaking to occupy that distinguished post. That he will confer additional distinction upon the presidential office cannot be doubted, in view of the honourable position which he has attained in the profession during his 25 years' public service as city electrical engineer, of which all but three years has been spent at Birmingham.

Mr. Chattock was born at Solihull, Birmingham, in 1865, and was educated at University College School, London, whence in 1881 he passed to University College, London, for his technical training, winning the Gilchrist Engineering Scholarship. From 1886 to 1889 he served as pupil in the ironworks of Messrs. John Stewart and Son at Blackwall, London, after which he joined the staff of the Metropolitan Electric Supply Co., Ltd., as junior engineer, in due course becoming engineer in charge of the company's generating station at Amberley Road, Paddington. In 1894 he was appointed chief electrical engineer to the Vestry of St. John, Hampstead, but a year later he assumed charge of the large generating station of the City of London Electric Lighting Co., Ltd., at Bankside. Entering municipal employ in 1900, as city electrical engineer to the Bradford Corporation, Mr. Chattock was appointed to his present post in 1903

Photo by] Mr. R. A. Chattock, President I.E.E. *[Lafayette, Manchester.*

Under his control the Birmingham electricity supply business has undergone an enormous development. The capital expenditure has increased from £588,000 to over £5,700,000, and the output of electrical energy from 3¾ million kWh per annum to 193 million kWh, whilst the revenue has grown from £67,000 to £1,200,000. It is interesting to note that in round numbers the original capital has been multiplied by 10, the revenue by 20, and the output by 50, showing what a vast change in the conditions has been wrought in 22 years. Considerable contributions have been made to the borough rate fund, and at the same time large reserve funds have been built up.

Mr. Chattock was responsible for the design and erection of the Summer Lane power station of 30,000 kW capacity, which was opened in 1906 and was a very notable example of d.c. generation on a large scale. When war broke out, heavy demands for electric power for the production of munitions of war, for which Birmingham was an important centre, rendered it necessary to build and equip a temporary generating station of 10,000 kW capacity, which was satisfactorily accomplished in 1915 in the short time of nine months; in the following year the plant was increased to 22,000 kW capacity, but still the demand grew, and in 1918 the Ministry of Munitions authorised the department to construct the Nechells power station, for the design and erection of which also Mr. Chattock has been responsible. The new station was opened by the Prince of Wales on June 12th, 1923, and is now called Prince's Station, Nechells; it contains three-phase generating plant of 75,000 kW capacity, and contracts have been placed for completing it to its full equipment of 105,000 kW. An illustrated description of the station was given in our issues of May 25th and June 1st, 1923.

Owing to the continued increase in the demand for electricity, Mr. Chattock is now engaged on the plans for another capital station; a site of 1,000 acres has already been purchased, with ample facilities for obtaining coal and water in quantities sufficient to meet all future requirements. He has consistently adhered to the policy of supplying direct current at the consumers' terminals, and for this purpose has adopted the mercury-arc rectifier on an exceptionally large scale, no fewer than 30 small automatic rectifier substations having been installed in the outlying parts of the city during the past three years. Similar apparatus has also been utilised for boosting the pressure on outlying sections of the network, thus avoiding a large outlay on long and heavy d.c. feeders. Recently Mr. Chattock has interested himself in the use of pulverised fuel, and after full investigation he has equipped six of the boilers at the Prince's Station with plant for this purpose, with a view to increased economy.

During the war, busy as he was, Mr. Chattock found time to take part in the formation and equipment of the Corps of Birmingham Electrical Engineer Volunteers, of which he was the honorary colonel. Some hundreds of electrical recruits were trained in this force, and were drafted into the Navy and the Army.

He has also been an active member of the leading electrical engineering institutions, and has been President of the Incorporated Municipal Electrical Association, Vice-president of the Institution of Electrical Engineers, and President of the Birmingham Association of Mechanical Engineers. For the past 34 years Mr. Chattock's working hours have been entirely devoted to the development of the electricity supply industry, and no better testimony to the ability and enterprise by which he is characterised could be found than the efficiency and the enormous expansion of the huge electrical undertaking under his control.

E

Electricity Supply at Halifax.

Recent Extensions at the Generating Station.

Since the installation in October, 1923, at the Halifax Foundry Street electricity works of a 10,000-kW turbo-alternator (Electrical Review, November 2nd, 1923), the rapid growth in the output demanded from the station has resulted in the recent extensions to the plant, which were inaugurated on September 3rd last, the opening ceremony being reported in our issue of September 11th. The extensions consist of a second 10,000-kW turbo-alternator, fig. 1, similar to the one referred to above, and the necessary auxiliary plant and switchgear. The turbo-alternator is of the British Thomson-Houston Co.'s manufacture and generates at 6,600 V, 50 cycles, running at 3,000 r.p.m. It will be recalled that the first set had the distinction at the time of its being installed of being the first of its capacity to run at such a high speed. The turbine is of the Curtis compound impulse type, with nine stages, the first stage having two rows of blades, and the remaining eight stages one row each. Steam is admitted at a gauge pressure of 160 lb. per sq. in. and at 180 deg. F. superheat, and exhausts into a 28-in. vacuum. The blades are made of phosphor bronze and the shaft is designed for a critical speed at 1,000 r.p.m.

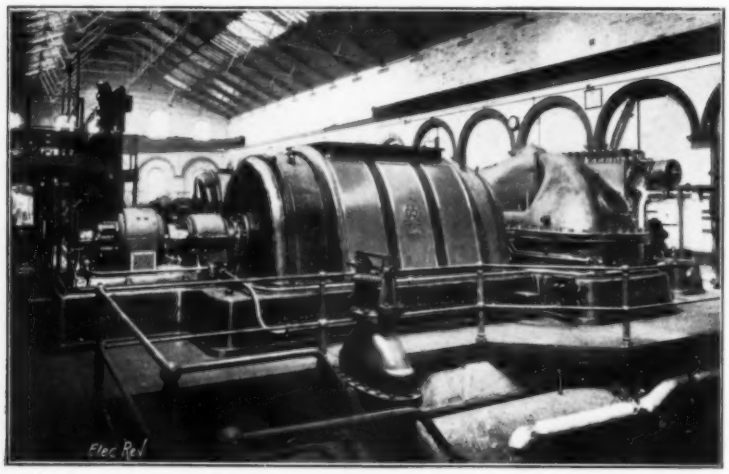


Fig. 1.—New 10,000-kW Turbo-Alternator.

The alternator is totally enclosed, air-cooled, and self-ventilating. In order to facilitate the running of the machine through the critical speed, the alternator outboard bearing is flexible to permit of small play between friction collars, and the radial movement thus allowed, with the resulting work done on the friction collars, completely destroys any tendency of the shaft to whip. A collector ring of steel, fitted with eight brushes, is mounted at each end of the rotor.

Fig. 2.—Turbo-generator Room at Halifax.

The condensing installation was built by Messrs. Worthington-Simpson, Ltd., to the specification prepared by the electrical engineer and manager, Mr. W. M. Rogerson, M.I.E.E. The turbine under full-load conditions exhausts steam at the rate of 125,000 lb. per hour, and the condenser maintains a vacuum equal to 1 lb. absolute pressure by means of specially-designed air extraction pumps. Its 7,300 tubes represent a cooling surface of 23,000 sq. ft.

The centrifugal circulating pump delivers 17,500 gallons of water per minute. The driving motor is of 300 b.h.p. The circulating-water system is interconnected with the other 10,000-kW set and a 6,000-kW set, with the necessary cut-out valves. The steam discharged from the ejectors is condensed in tubular coolers through which the condensed steam from the main condensers is delivered, and all the latent heat from the steam is imparted to the condensate and returned to the boilers.

The switchgear installed in this station was supplied by the British Thomson-Houston Co., Ltd., and is arranged in two distinct banks. The first bank, comprising the generator switches, is connected by two group feeders to the second bank, which contains the switchgear controlling converters and local feeders. By this arrangement local faults of small magnitude are cleared by the circuit breakers of smaller capacity on the feeder bank without disturbing the generator bank. Both banks have duplicate sets of bus-bars, and the h.p. switchgear is of the cellular type. Circulating current protection is provided for the generators, and is used in conjunction with field-suppression equipment. In addition, stand-by overload relays are provided.

Extensions now being installed comprise two 8,000-kVA feeder circuits on the generator bank for supplying the new sub-station at Highroad Well; they will control the full exchange of power with Huddersfield. The total capacity of the station is now 31,000 kW.

The Supervisory Control of Sub-Stations.

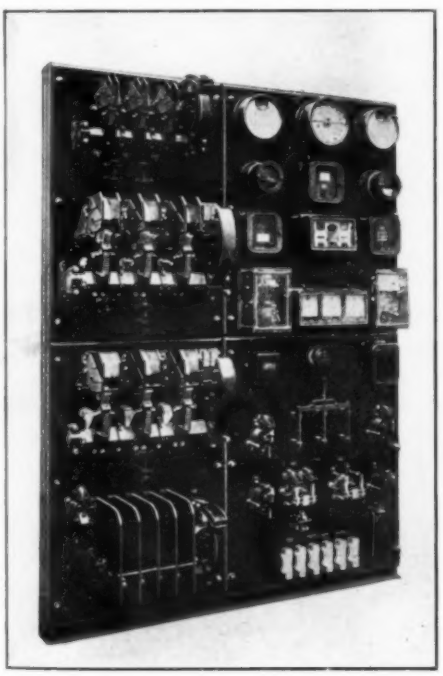
Metropolitan-Vickers Automatic Plant for New Zealand.

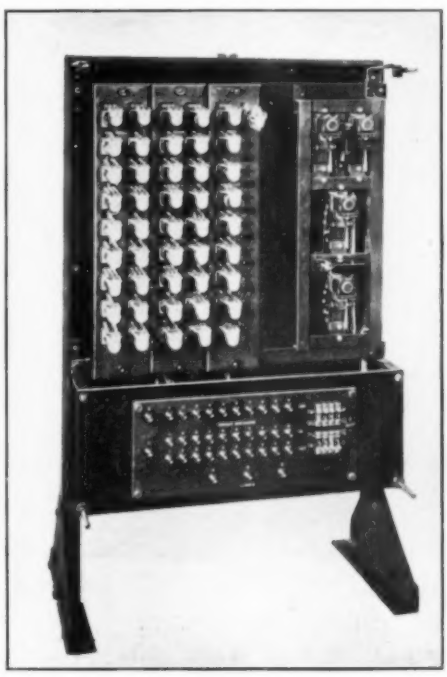
Last week's convincing demonstration of the supervisory control of one of the sets of automatic sub-station equipment which the Metropolitan-Vickers Electrical Co., Ltd., is supplying for the City of Wellington, New Zealand, electricity undertaking is of interest for several reasons. It is the first example of control gear of its kind to be manufactured in this country, and consists of the application of automatic telephone apparatus to the remote control of electrical plant and switchgear. Only three single telephone wires are necessary between the control room and the distant plant, however great the distance, and however many the operations to be performed. Telephone communication can be carried on over the same wires.

Each of the three sub-stations contains a 750-kW, tap-started rotary converting to 550 volts d.c. When in a residential district, the buildings are constructed sound-proof. Initially there was some doubt about which method of controlling the stations would best suit the local conditions. Accordingly alternative methods were provided for the Newtown traction station (first in commission in the late spring of 1924) either of which can be selected as desired:—Fully automatic, load demand; remote control by two pilot wires; and time switch, in addition to emergency manual control, subsequent operations being entirely automatic. Whichever method of initiative control is used, the starting operations are the same:—(i) The energising of the master contactor completes the control circuit from an auxiliary transformer; (ii) the brushes on the machine are raised, the starting contactor and main oil circuit breaker are closed; (iii) should the machine build up with wrong polarity, a field contactor controlled by a polarised relay corrects it; and (iv) the starting contactor is then opened and the running contactor closed, putting the machine on to full voltage; (v) when the brushes are lowered and the field has been built up, the machine is connected to the d.c. bus-bars through steps of limiting resistances, which are then cut out by shunting contactors if excessive current is not passing.

The protective features provide against the following contingencies:—(*a*) Faulty a.c. supply (low voltage, open or reverse phase); (*b*) excessive a.c. overloads; (*c*) faults (external or *internal to the sub-station) causing unbalanced currents; (*d*) overheated machine and transformer windings due to repeated overloads; (*e*) wrong polarity; (*f*) field failure; (*g*) *overspeed; (*h*) d.c. overloads; (*i*) d.c. reversals; (*j*) overheated limiting resistors; (*k*) *hot bearings; (*l*) *incomplete sequence of starting operations; and (*m*) *earths on machine (flash-overs) on later sets only. In the event of troubles marked * a lock-out relay will shut down the equipment and will prevent it re-starting until hand reset. If the shut-down is due to hot windings or resistors the set will be re-started when sufficiently cool, while the traction feeders are only tripped by the occurrence of faults and not by legitimate overloads, and are automatically restored to service when of a suitable resistance, thereby maintaining the service up to the utmost limit with safety.

Fig. 1.—Supervisory Control Office Desk.





Figs. 2 & 3.—Low-pressure Contactor Panels and Relay Rack in Sub-station.

The Thornton and Karori stations differ from the above-mentioned plant chiefly in that the h.p. gear is of the M.-V. armour-clad type with a.c. motor-operated closing mechanisms on "K.I." oil circuit breakers of 150,000 kVA capacity. The closing mechanism is noiseless in operation, and permits of the use of a small control transformer of approximately 0.5 kVA capacity;

the latter, together with a 3-phase potential transformer, is contained in one tank with h.p. fuses and limiting resistances, and can be withdrawn on wheels without interfering in any way with the remainder of the gear, the live receptacles being automatically shuttered when the tank is pulled forward. Shunt-wound machines with one step of limiting resistances are used instead of level-compounded machines with three steps.

The Karori station is provided with all the methods

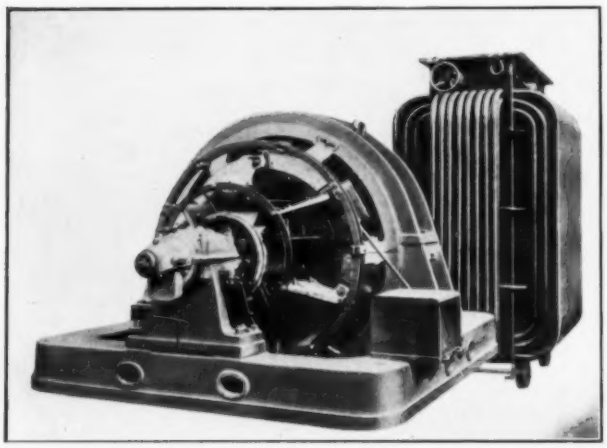


Fig. 4.—825-kVA Transformer and 750-kW Rotary used in Demonstration.

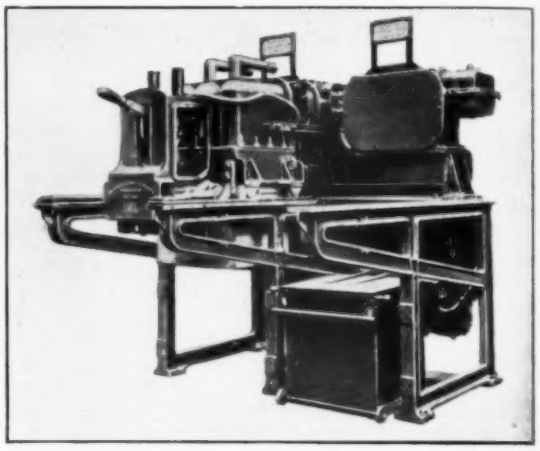


Fig. 6.—High-pressure Switch and Motor-operated Circuit-Breaker, A.C.

of control fitted at Newtown, but its a.c. oil circuit breaker and d.c. main and feeder contactors have auxiliary switches so as to permit supervisory control to be added later.

In the case of the Thornton sub-station the supervisory gear has been made by the Automatic Telephone Manufacturing Co., of Liverpool, its arrangement being a joint design. The relays used are identical with those

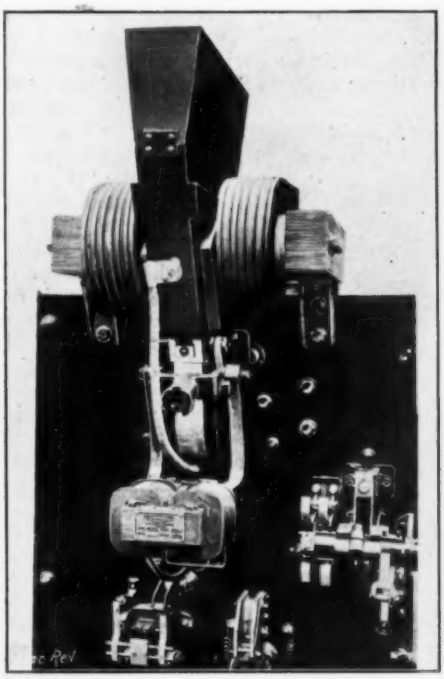


Fig. 5.—High-speed Circuit Breaker, D.C.

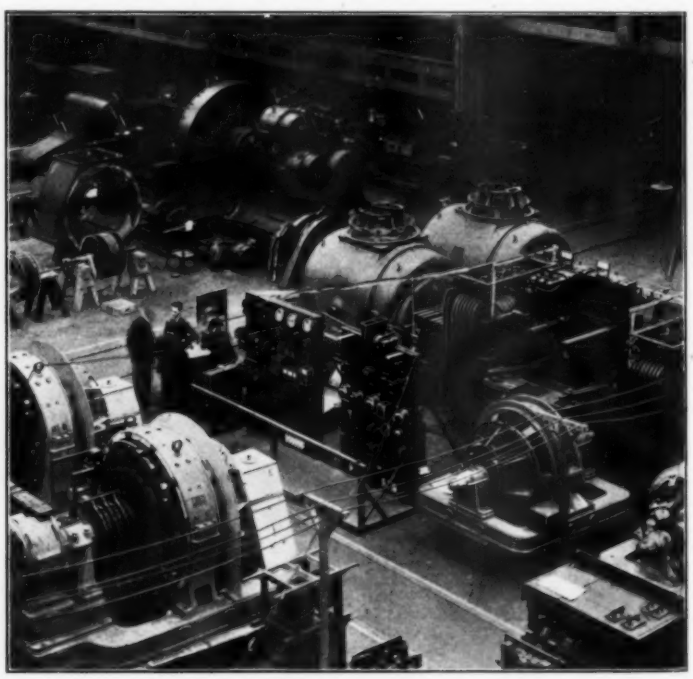


Fig. 7.—Equipment on Test at Trafford Park.

embodied in the automatic telephone exchanges in successful operation in many parts of the world and with those being made for the new G.P.O. London exchanges in course of construction.

The control room equipment comprises a desk with keys for selecting and controlling the desired devices in the sub-station, and indicating lamps to show their condition, together with rotary stepper switches and relays for the transmission and receipt of signals to and from the sub-station. The relays and switches with protective fuses are housed on the left-hand side of the desk (fig. 1). On the sloping top of the desk are the double-way selective keys, each with its four associated lamps, suitably labelled with the names of the devices they control. Each group of lamps consists of two white, one red, and one green. Selective keys are provided (*a*) to start and to shut down the rotary converter, the associated indicators being red for machine a.c. oil circuit breaker closed, and green for the open position. (*b*) To close or open the main d.c. contactor and resistance shunting high-speed circuit breaker. (Provision is made in the sub-station so that, if desired, these contactors will operate automatically, the signals still being sent back.) The associated red and green lamps show whether the main contactor is closed or open. (*c*) To close or open any of the outgoing traction feeders, one key for each feeder with its associated red and green lamps showing whether the corresponding contactor is closed or open. Lamps are provided to indicate if the machine is locked out. Separate from the selective keys is a distinctive operating key, and the purpose of the repeat signal key is to check the indications of the position of all devices indicated, while another stops the bell ringing, which alarm warns the operator at the control office when any device in the sub-station changes its position. A 48-V d.c. supply is necessary for energising the apparatus and indicators.

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In the sub-station a cabinet contains the necessary relays and stepper switches for receiving signals to select the device to be operated and similar apparatus for the transmission of signals to the control office, whereby the indicating lamps show the position of each device. A Tungar rectifier controlled by a time switch automatically recharges the battery, and there are also interposing relays for linking together the supervisory relays and the devices controlled. Two such relays are required per circuit breaker, one to make the closing-coil circuit and the other the tripping circuit. Each circuit breaker to be indicated is fitted with the necessary auxiliary switches for operating the signal relays.

For convenience of explanation assume the sub-station is shut down; the green lamp corresponding to the "start" selective key will be glowing, indicating the main oil circuit breaker is in the open position. The operator at the control office pushes the "start" key downwards (movement in the upward direction would "close down" if the machine was running). This energises a relay which prevents any other operation signal being sent simultaneously, and also energises a rotary stepper switch having wipers which sends out 25 impulses to the sub-station. The polarity of these impulses is reversed when the stepper switch passes over a contact connected to the particular selective key.

At the sub-station a relay picks up the impulses and starts off two rotary stepper switches (A and B) each with three wipers. When the reversed impulse is received one stepper switch (B) stops, one (A) continues to rotate, and a third stepper switch (C), also with three wipers, starts off. At the end of the 25 impulses these come to a standstill, (A) being then on its 25th contact. One set of contacts on (B) and (C) are connected oppositely together, so that, if conditions are correct, the difference between the impulses taken by (B) and (C) complete a circuit, whereby the sub-station battery sends a current along the pilot wires to operate a relay at the control office to cause the white lamp, corresponding to the selective key which was operated, to glow and show that the device to be operated has been correctly selected. The time taken is about three seconds from moving the selective key to receiving the white lamp signal.

The operating pilot wire is also now suitably connected so that the operator, by depressing the special operating key, completes a circuit energising a pilot relay which, by means of an interposing relay, immediately energises the master contactor of the automatic equipment. The usual sequence of starting operations will now take place, and the supervisory relays will reset themselves to normal when the selective key is returned to its normal position.

When the oil circuit breaker of the machine closes, an auxiliary switch completes the circuit of a relay forming part of the supervisory equipment, which brings into action a stepper switch (D), having four wipers, and also causes the pilot wires to be changed from the impulse-receiving to the impulse-transmitting apparatus. Alternative contacts of one of the wipers is associated with an auxiliary switch on each circuit breaker to be indicated. Impulses of different polarity are sent by the switch (D) to the receiving relays at the control office. The first impulse sent is positive, but the following ones are negative except when the wiper crosses a contact associated with a closed circuit breaker, in which case the impulse is positive.

At the control office three relays are provided, one of which responds to all signal impulses received, another to positive, and one to negative impulses only. When the first (positive) impulse is received at the control office the pilot wires are disconnected from the impulse-sending and connected to the impulse-receiving relays. The relay responding to all impulses causes a rotary stepper switch (E) with three wipers to step in unison with the impulse sender switch (D). Should a positive impulse be received when one of the wipers of (E) is on a contact, a relay causes the red lamp to show that its corresponding circuit breaker in the sub-station is closed. Similarly, negative impulses result in the corresponding green lamps being illuminated, showing circuit breakers in the open position.

(To be concluded.)

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia.—SYDNEY.—November 30th. Public Works Department. Metering equipment for the Barren Jack hydro-electric development scheme and the Kiama-Nowra transmission line.*

MELBOURNE.—December 1st. Postmaster-General's Department. Motor-generator sets for charging secondary batteries. (October 2nd.)

December 14th. Electricity Commission of Victoria. 22,000-V insulators. (See this issue.)

SYDNEY.—December 16th. New South Wales Government Railways and Tramways. 10 single-phase, 1,800-kVA transformers.*

Belfast. — November 2nd. Electricity Department. Motor-generator and transformer. (October 9th.)

Belgium.—Municipal authorities of Ghent. Four or eight electric cranes for the northern quay of the Central Dock. Particulars (Cahier des Charges No. 1,573) from Hotel de Ville.

November 4th. Société Nationale des Chemins de Fer Vicinaux, 14, Rue de la Science, Brussels. Overhead equipment in connection with the electrification of the Binche-Leval-Trahegnies local railway. Particulars for 5 fr. from Bureaux des Services Electriques, 48, Rue Montoyer, Brussels.

Bristol.—October 19th. Port of Bristol Authority. Two 2-ton electric capstans. Specification from the General Manager and Secretary, 19, Queen Square, Bristol.

Dartford.—October 17th. Electricity Works. Small steam coal for 6 or 12 months. (October 9th.)

Dublin.—Electricity Department. Transformers for one year. City Electrical Engineer, Fleet Street, Dublin.

Dublin Borough Commissioners. Electric wiring of 416 houses at Croydon Park. City Architect, Exchange Buildings, Lord Edward Street, Dublin.

Egypt.—CAIRO.—December 1st. Ministry of Public Works. Two pumping units and accessories for the Mex pumping station.*

Glasgow.—October 19th. Parish Council and District Board of Control. Stores, including electrical fittings, for six months. Forms of tender from Mr. M. A. Reynard, inspector and clerk, 266, George Street.

Kilmarnock.—Electric lighting work in connection with the Corporation Riccarton housing scheme. Particulars from Mr. Wm. Dunbar, burgh surveyor.

Leeds.—October 20th. Tramway Department 150 double-deck top-covered tramcars complete, or, alternatively, 150 tramcar bodies, 190 tramcar trucks, including wheels and axles, 190 tramcar electrical equipments. (October 2nd.)

London.—H.M. OFFICE OF WORKS.—November 3rd. Installation of cables, switchboards, &c., and wiring at the Ministry of Pensions Hospital, Orpington. (See this issue.)

November 4th. Electric wiring in conduit at Montagu House. (See this issue.)

METROPOLITAN ASYLUMS BOARD. November 4th. Installation of two new hydro extractors at the Western Fever Hospital, Seagrave Road, S.W.; installation of hot-water heating apparatus at St. Anne's Home, Herne Bay; and installation of automatic telephones at the Downs Hospital for Children, Sutton, Surrey. (See this issue.)

PADDINGTON.—November 3rd. Great Western Railway. Telegraph instruments, electrical apparatus, &c., telegraph ironwork and tools, telegraph drysalterers. November 20th. Electrical wires and cables. (See this issue.)

Manchester. — November 6th. Electricity Committee. One 500-kW fully automatic, motor or rotary converter, transformers and switchgear, &c. Three 500-kW fully automatic, motor or rotary converters or mercury-vapour rectifiers, transformers, switchgear, &c. (See this issue.)

Newport (Mon.).—October 28th. Electricity Department. Electrically-driven pumps, pipework, valves, &c.; switchgear; water-screening plant. (October 2nd.)

New Zealand.—HASTINGS.—February 1st. Borough Council. Diesel engine and a.c. generator.*

Sheffield.—October 20th. Tramways and Motor Department. 50 double-deck vestibule tramcars. (October 9th.)

Sleaford. — October 20th. Electricity Department. Cables, &c. (October 9th.)

Southampton.—November 2nd. Harbour Board. Alterations to the electrical equipment of 12 cranes, supply of cables, disconnecting boxes, switchgear. Specifications from Mr. W. G. Gubbins, clerk, Harbour Offices.

Southend-on-Sea.—Light Railways and Electricity Department. House-service meters and demand indicators. (October 2nd.)

Uruguay. — Montevideo.—December 22nd. State Electricity Supply Works. 200,000 metres r.i. wires and cables.
December 28th. 1,060,000 metres of special cable for outside use.
November 27th. H. and l.p. cables and accessories.*
January 7th. 26,000 kilograms of copper wires and cables.*
January 8th. Black and G.I. wire, &c.*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Australia.—Sydney.—Electricity Supply Committee. Recommended:—
Gasfilled lamps (£4,594).—Australian General Electric Co., Ltd.
H.p. and l.p. cables.—Siemens Bros. & Co., Ltd. (£91,718); Enfield Cable Works (Aust.), Ltd. (£35,445).
Overload relays (£1,558), leakage relays (£494), reverse-power relays (£1,681).—Metropolitan-Vickers Electrical Co., Ltd.

Postmaster-General's Department.
Accumulator plates (£1,407).—Tudor Accumulator Co., Ltd.

Adelaide.—Postmaster-General's Department.
Telephone switchboard material at the Central, Unley, Norwood, and Hyde telephone exchanges (£4,029).—Western Electric Co. (Aust.), Ltd. —*TENDERS.*

Barrow.—Electricity Committee. Recommended:—
E.h.p. transmission lines in connection with the supply to Grange, &c. (£16,903).—Johnson & Phillips, Ltd.

Bradford.—Tramways Committee. Accepted:—
20 tons track brake blocks (£190) and 30 tons Peckham hand-brake shoes (£300).—Cole, Marchent & Morley, Ltd.
24 tramcar split-gear wheels (£164).—Alfred Wiseman, Ltd.
100 steel tires for tramcar wheels (£300).—John Brown & Co., Ltd.

Bournemouth.—Town Council. Accepted:—
Reconstruction of the Poole (tramway) line (£19,617).—Alex. Stark and Sons, Ltd.
Tramway rails (£6,390).—Cargo Fleet Iron Co.
20 car sets of electrical equipment (£11,680); 20 B.W. magnetic and track brakes (£5,900); spares (£1,840).—Metropolitan-Vickers Electrical Co., Ltd.
20 car bodies (£27,200); 20 pairs of Maximum traction trucks (£5,700).—Brush Electrical Engineering Co., Ltd.

Chester.—Board of Guardians. Accepted:—
Electrical goods for the Institution.—Commercial Electrical Co.

Colchester.—
Electric lighting installation at Wolterton Hall.—Truslove & Co.

Edlington.—Rural Council. Accepted:—
Wiring houses for electric light (£264).—Building & Colliery Supply Co., Ltd.

Glasgow.—Electricity Committee. Recommended:—
Two 400-kVA transformers for sub-stations (£1,014).—Metropolitan-Vickers Electrical Co., Ltd. Two ditto, ditto (£1,014).—British Electric Transformer Co., Ltd.

Hastings.—Town Council. Accepted:—
Cable (£7,565).—W. T. Glover & Co., Ltd.

Imatra.—It is reported that Brown, Boveri & Co., of Mannheim, have secured, in international competition, an order from the Finnish Government for the supply of high-pressure equipment both for the Imatra hydro-electric works and for six transformer stations. The value of the order is put at £150,000.

London.—London County Council.—Education Committee. Accepted:—
Wiring and fittings for electric lighting at the Paddington and Maida Vale High School (£450).—Star Electrical Co., Ltd.

Manchester.—Paving, &c., Committee. Accepted:—
Re-insulating main cable in connection with penstocks in Essex Street, Old Trafford.—Lancaster & Bowen, Ltd.

Tramways Committee. Accepted:—
Battery-charging equipment.—Lancashire Dynamo & Motor Co., Ltd.
One b.h.p. motor, &c.—Veritys, Ltd.

Education Committee.
Electric lighting installations, Harpurhey High School and Queen Street Central School.—J. A. Somerset & Co.

Newcastle-on-Tyne.—The daily Press states that the City Council has accepted the tender of the United States Steel Products Co. for a tramway junction, the offer being 25 to 30 per cent. lower than any other.

Richmond-on-Thames.—Board of Guardians. Accepted:
Installing electric light at the Grove Road Institution (£609).—Richmond Electric Light and Power Co., Ltd.

Sheffield.—Electric Supply Committee. Accepted:—
Transformers (£2,052).—British Electric Transformer Co., Ltd.

Weymouth.—Electricity Committee. Recommended:—
510 yd. of cable (£228).—Johnson & Phillips, Ltd.

Winchester.—Town Council. Accepted:—
One 1,250-kW geared turbo-generating set (£5,435); condensing plant, with a condenser of 2,450 sq. ft. cooling surface (£2,467); contingencies (£198).—British Thomson-Houston Co., Ltd.

Forthcoming Events.

Association of Mining Electrical Engineers (South Wales Branch).—Saturday, October 17th. At the South Wales Institute of Engineers, Cardiff. At 6 p.m. Paper on the "Transmission of Power by Leather Belting," by Mr. T. Cliff Brown.

Electrical Power Engineers' Association (Southern Division).—Saturday, October 17th. At the Hotel Cecil, Strand, W.C. At 5.30 for 6 p.m. Annual dinner.

Batti-Wallahs' Society.—Wednesday, October 21st. At the Hotel Cecil. Luncheon. Speaker, Sir Hugo Hirst, Bart.

Institution of Electrical Engineers.—Thursday, October 22nd. At the Institution, Victoria Embankment, W.C. At 6 p.m. Presidential address by Mr. R. A. Chattock.

(South-Midland Centre).—Wednesday, October 21st. At the Grand Hotel, Birmingham. At 6.45 p.m. Inaugural address by the Chairman, Mr. F. J. Moffett.

(Dundee Sub-Centre).—Thursday, October 22nd. At the University College, Dundee. At 7.30 p.m. Address by the Chairman, Mr. J. S. Thomson.

(Sheffield Sub-Centre).—Wednesday, October 21st. At the Royal Victoria Hotel, Sheffield. At 7.30 p.m. Address by the chairman, Mr. W. F. Mylan, and smoking concert.

Junior Institution of Engineers.—Friday, October 23rd. At 39, Victoria Street, S.W. At 7.30 p.m. Lecturette, "The Construction and Laying of Reinforced Concrete Pipes," by Mr. H. S. Brown.

(North-Western Section).—Monday, October 19th. At the Geographical Society's Room, 16, St. Mary's Parsonage, Manchester. Lecturette, "Engineering Troubles," by Mr. A. N. Haworth.

Birmingham Electric Club.—Friday, October 23rd. At the Grand Hotel, Colmore Row. From 7 p.m. to 2 a.m. Ladies' evening. Ball and whist drive.

Physical Society of London.—Friday, October 23rd. At the Imperial College of Science, South Kensington, S.W. At 5 p.m. Ordinary scientific meeting.

Engineers' Club (London).—Friday, October 23rd. At the Savoy Hotel, Strand, W.C. Annual dinner.

Institution of Mechanical Engineers.—Friday, October 23rd. At the Institution, Storey's Gate, S.W. At 6 p.m. Presidential address by Sir Vincent L. Raven, K.B.E.

Notes.

Sir Adam Beck's Successors.—Writing with reference to the death of Sir Adam Beck and the consequent new appointments to the Hydro-Electric Power Commission of Ontario, our Canadian correspondent says:—"At the time of Sir Adam's death there was only one other Commissioner, the Hon. J. R. Cooke, serving on the Hydro-Electric Power Commission, although the normal number of Commissioners is three. Since that event the Ontario Government has appointed two Commissioners, bringing the total to three again; these are C. A. Magrath and C. A. Maguire, the former being chairman. The choice of Mr. Magrath was undoubtedly made on account of his intimate knowledge of problems connected with the development of the St. Lawrence river, and few men in Canada can know this subject as he does, for he has been the chairman of the Canadian Section of the International Joint Commission since 1911, and has not yet relinquished that post. During this period this Commission has had referred to it by the Governments of the United States and Canada many problems relating to transportation and water power development on the international waters separating the two countries, including those of the Niagara and St. Lawrence rivers, as well as of the Great Lakes. The new chairman and the Hon. J. R. Cooke are both, it is understood, men who are interested in the eastern section of the province, and no doubt this section will receive somewhat more attention in the future than it has done in the past, although it was perfectly natural that the needs of South-Western Ontario should have been taken care of first, because of early hydro-electric development at Niagara Falls and on account of the greater density of population in that part of the province. Mr. Maguire, the third Commissioner, has for several years taken an active interest in the work of the Hydro-Electric Power Commission of Ontario, and has fought for the cause of public ownership on many occasions, and in 1922 and 1923 he was Mayor of Toronto. The new appointments have been very generally approved in all parts of Ontario."

The Batti-Wallahs.—The Batti-Wallahs' Society opens the new session with a luncheon at the Hotel Cecil on Wednesday's October 21st. Sir Hugo Hirst, Bart., will speak on questions of industrial interest.

The Electrical Association for Women.—The above Association has received an invitation from the E.L.M.A. Lighting Service Bureau (15, Savoy Street, Strand, W.C.) to a lecture and discussion on "Home Lighting," by Miss Florence Hodge, on October 20th, at 3.30 p.m. The main lines of the lecture will be: Light from the point of view of health, comfort, and beauty. An invitation has also been received from Mr. Percy Best to visit a special display of electrical apparatus at Messrs. Shoolbreds (Tottenham Court Road, W.) on November 3rd, at 3.30 p.m. A lecture on "The Artistic Value of Electricity in the Home" will be given. In response to a number of requests from those employed in the electrical industry, domestic science teachers and lecturers, a series of three lectures is being arranged, giving a brief review of the electrical industry, its economic features, meaning and purpose, with simple explanations of electrical phraseology, &c. It is proposed to hold these lectures in the London centre.

Electricity Supply at Stoke-on-Trent.—HANLEY EXTENSIONS.—Yesterday an addition to the plant of a Metropolitan-Vickers 6,000-kW turbo-generator, with four Stirling boilers and two Davenport cooling towers, was to be officially inaugurated. Particulars will be given in a later issue.

Scientific and Industrial Research.—The report of the Committee of the Privy Council for Scientific and Industrial Research for the year 1924-25 has been published by the Stationery Office (Cmd. 2491, price 3s. net). It will be reviewed in our next issue.

Electric Signals for Road Traffic Regulation.—For many years the state of traffic in Paris was little less than a by-word; there was very little regulation, and taxi drivers went where they liked, how they liked. Some years ago some members of the Paris police were sent over here to study London methods, and things gradually got better, until at present those who were pupils have in some ways improved on their former teachers. In order to aid traffic control illuminated signals have been put up on independent pillars, or have been attached to existing lamp standards. Perhaps the point in Paris with the heaviest traffic is where the Avenue de l'Opéra with the Rue de la Paix and the Rue 4 Septembre meets the Grands Boulevards.

At this crossing a number of circular signal lanterns with top shades have been placed on lamp-post islands, facing towards the oncoming traffic, with a word indicating "Stop" in white letters on a red ground. These lamps are fixed at a height sufficient to enable them to be seen by drivers some little distance away. When traffic is to be held up from one quarter the current is switched on to the lamp, and a red light is shown which aids the policeman on point duty. When the road is about to be made clear an electric bell is rung giving a warning to drivers to stand by, and the lamp

Traffic Control Signal in Paris.

is switched off, another lamp or group of lamps being switched on to block cross routes. At the point in question the lamps are controlled at a central switch box on the kerb in front of the stairs leading down to the underground railway, and a traffic director can therefore control the traffic to and from the seven converging roads. There are apparently repeaters further back which can be switched on when required.

A great improvement also has been made by the arrangement of one-way streets, some quite important thoroughfares being arranged in this way; for instance, the street from the Opera Square in question towards St. Lazare Station. The improvement in general traffic must easily make up for having to go beyond and round through a cross street and back to the point required.

To indicate unidirectional streets there are red disks in minor streets illuminated at night by neighbouring existing street lamps, and in a number of important streets there are standards each with a translucent, semi circumferential sign, with white letters on a red ground, indicating that the direction facing the indicator is forbidden to traffic. Attention is further drawn to the sign by a flashing red signal lamp placed above the sign, which by the flashes tends to catch the eye of the motor driver.

The Ministry of Transport has investigated this system of lamp signals, which is now used at a number of points in Paris, and is about to carry out experiments in London on similar lines.

Fatalities.—A verdict of "Death by misadventure" was returned at an inquest at Scunthorpe, Lincs., on October 7th, into the death of Walter Bates (27), floor layer, who was killed in the new Crosby Parish Church which was consecrated recently. Bates was working in the church and took hold of a temporary lamp fitting, receiving a shock. The patent jointless floor of sawdust and certain acids made a good conductor, and the man's damp clothing and boots combined to bring about the shock. In returning the verdict the jury added that no blame could be attached to anyone.

The circumstances of the death of Mr. Victor John Scott (33), electrician, employed by Messrs. Geo. Hargreaves & Co., at Calder Pit, Altham, Lancs., whose body was recovered from a lodge, were investigated by the coroner on October 9th. The latter returned a verdict that deceased walked into the lodge by mistake, and thus met his death by drowning accidentally.

Manchester Electro-Harmonic Society.—To-night, Friday, at the Albion Hotel, Piccadilly, Manchester, the seventh season of the Manchester Electro-Harmonic Society will be opened with the first of a series of six monthly concerts. Mr. S. L. Pearce has been compelled to relinquish the presidency, owing to his recent appointment as an Electricity Commissioner and his removal to London. His influence and support have been highly appreciated. Mr. J. A. Robertson, M.I.E.E., is succeeding Mr. Pearce as president. We understand that the prospects for a highly successful season are very bright. The Society was inaugurated to provide an opportunity for those employed in all sections of the electrical industry to meet together for entertainment and social intercourse during the winter months. The President and Committee, therefore, extend a hearty invitation to members of all sections of the industry within easy access of the meeting place, to become members. They also extend a hearty invitation to representatives of electrical companies from other towns who may be visiting Manchester on the dates of the Society's meetings, which are as follow:—1925—October 16th, November 20th, December 18th; 1926—January 15th, February 19th, March 19th. The presentation of a trade card will be sufficient introduction, and no charge is made for admission. The membership is steadily increasing. Mr. W. J. Smith has again consented to act as hon. musical director, and the splendid services rendered in this capacity in the past are a guarantee of the excellence of future programmes. For to-night's concert the artistes will be:—Soprano, Madame Sophie Thomson de Konsben; contralto, Miss May Carrington; baritone, Mr. S. Hutchins; entertainer, Mr. Livingston Eccles; pianist and accompanist, Mr. Granville Hill. Correspondence relating to membership in, or contemplated visits to, the Society should be addressed to the hon. secretary, Mr. C. E. Leak, 196, Deansgate, Manchester, or to the assistant hon. secretary, Mr. W. Kirkham, 14, Ellesmere Road, Chorlton-cum-Hardy. Subscriptions for the season, now due, should be sent to the hon. treasurer, Mr. H. Marlor, the Manchester Corporation Electricity Department, Town Hall, Manchester.

Faraday House Old Students' Association.—The seventeenth annual dinner of the Association will be held at the Piccadilly Hotel, on Friday, November 6th. Mr. H. W. H. Richards, M.I.E.E., electrical engineer to the London and North-Eastern Railway, President of the Association, will be in the chair. Members of the Association are reminded that they may introduce guests, who need not necessarily be Faradians. A musical entertainment will, as usual, follow the dinner, and early application for tickets (price 12s. 6d. each) should be made to Mr. H. W. Fairman, Faraday House, Southampton Row, London, W.C.1.

Electricity Supply in Fulham.—INAUGURATION OF EXTENSIONS.—The new extension at the Townmead Road generating station of the Metropolitan Borough of Fulham was opened on Tuesday last by the Mayoress of Fulham, Mrs. E. H. Pritchard, in the presence of a large and representative gathering. The total capacity of the station is now just over 18,000 kW. The new plant comprises two turbo-alternators rated at 6,000 kW at 0.8 p.f., 6,600 volts, 50 cycles; three boilers, each evaporating 40,000 lb. per hour at 275 lb. per sq. in. with a total temperature of 700 deg. F. at the turbine stop valve; Scott-connected transformers; ironclad switchgear; and all the necessary auxiliaries, including mechanical equipment for the delivery of coal and removal of ashes.

Those present at the inaugural function afterwards attended a luncheon in the Fulham Town Hall, at the invitation of the chairman and directors of Messrs. Vickers, Ltd., the sole contractors for the extensions. The chairman at this function was Sir Vincent Caillard, D.L., J.P., who, in proposing the toast of the Borough of Fulham, coupled with the Electricity and Lighting Departments, paid tribute to the many advantages offered by the borough, including that of a progressive policy with regard to electricity supply. Fulham was fortunate in having so excellent a site for its electricity undertaking, with an adequate supply of condensing water, cheap transport facilities for coal, and room for easy and economical extensions as required. In replying to this toast, Councillor D. S. Van den Bergh, chairman of the Electricity Committee, said that the policy in Fulham had been to supply electricity at the lowest possible price consistent with the economical and efficient running of the power station. During the past three years no less than £14,000 had been handed over for the relief of rates in the borough. The cost of electricity for lighting had been reduced by 1½d. per unit, and for power by ½d. per unit, and, with the increased production now possible, it was hoped that the Townmead Road plant would become the cheapest public supply station in London. In placing the order for the present extensions with Messrs. Vickers, the Committee had been influenced by the fact that

the firm's organisation was such that it could undertake the whole contract. British labour and British material had been used throughout, local unemployed had been used wherever possible for work on the site, and the Committee felt entirely justified in having given the contract to a British firm, notwithstanding the lower tenders received from abroad.

Mr. Arthur J. Fuller, M.I.E.E., borough consulting and electrical engineer, also spoke in reply, and gave interesting figures concerning the rapid growth of the undertaking. On account of its admirable site and the efficiency of the works, he said, the Fulham generating station might eventually take an active part in the development of electricity supply far beyond the limits of the borough. The amount of money spent on installing electric lighting, &c., in Fulham averaged about £20,000 per annum, and during the past 18 months 600 small properties had been connected, the average rental of which would not exceed 15s. per week. There could be no doubt that further extensions would be required in the near future. A point of vital importance in the extensions just completed had been the fact that Messrs. Vickers had got the first machine running in six months from the date of signing the contract, notwithstanding the delay occasioned by the building strike and other labour troubles. But for this record performance, it would not have been possible to meet the demand on the station last winter.

The toast of "The Contractors" was proposed by Councillor E. R. Armfield, J.P., vice-chairman of the Electricity Committee, and in his reply Sir Philip Nash, K.C.M.G., C.B., spoke of the advantages accruing from the vast resources of the companies associated in the Vickers group. Last year his own company alone had supplied machinery and equipment to 20 different nations, and it was the experience obtained in this way which made it possible for a single concern to deal with such a comprehensive scheme as the Fulham extension. The health of the Chairman was proposed by the Mayor of Fulham, Councillor E. H. Pritchard, B.A., J.P., and a kinematograph display was then given to demonstrate the progress of work on the extensions and the varied nature of the equipment needed to build and operate a modern power station.

"Reco" Batteries.—Correction.—It appears that our recent remarks regarding the Radio Equipment Co.'s batteries have been taken to imply that these batteries are only suitable for d.c. supply. We are asked to point out that both the high- and low-pressure batteries of this type can be supplied for use on a.c. as well as d.c. circuits.

Appointments Vacant.—Assistant power station chemist (250 taels per month; tael=3s.) for the Shanghai Municipal Council Electricity Department. Two junior charge engineers for the City and County of Bristol Electricity Department. Assistant mains engineer for the Borough of Portsmouth Electricity Department. Switchboard attendant, for Newport Corporation Electricity Department. Meter mechanic, for Rawtenstall Corporation Electricity Department. (See our advertisement pages to-day.)

The "Public Address" System.—The Western Electric "Public Address" system of loud speakers has been installed by Mr. E. J. Allan, for the Corporation, in the Caird Hall at Dundee. On being tested by members of the Town Council the system was described as very satisfactory.

Institution Notes.

Institution of Electrical Engineers.—Midland Sub-Centre.—The Midland Sub-Centre held its opening meeting at Loughborough, when Mr. B. Adair M. Royce, chairman, gave an address on "Energy." Starting from the dictum that energy was the basis of life, the lecturer went on to indicate the sun as the primary source of all energy—the mechanical energy in the rotation of the earth, the heat energy in the interior of the earth, and radio-active energy. If it were possible to increase the length of the day by five minutes, he said, by decreasing the speed of the rotation of the earth, the stored energy released would amount to 1,000 million h.p. for 70,000 years. We made comparatively inefficient use of the energy that we could control. In a modern medium-sized electricity generating station we only got 15 per cent. of the heat of the coal as electrical energy and threw away 61.6 per cent. of this heat in the condensing water. Of 249 million tons of coal raised in Great Britain in 1922, only 2.7 per cent. was used in electrical generating stations, while domestic fuel accounted for 15.2 per cent., probably the most inefficient way of using coal. The figures for the electricity used in 1922-23 showed that 80 per cent. of the population used under 100 kWh per head, and only 1.1 per cent. used 300 or over. In 1920 the figures for the United States were 176 kWh per head, against our 60, and about the same ratio existed to-day. Comparing the efficiency of the human body with generating stations, he said the useful efficiency of the body was about 10 per cent., nine-tenths of the energy being used to maintain the body heat. The average available energy per day was only about 340 foot-tons, or just over a quarter of a kWh, costing about three-halfpence at the Loughborough lighting rate. It was more efficient to buy energy through a meter for every possible purpose in life than to use muscular energy. Mr. W. Pearson presided, and the annual report presented by Mr. J. F. Driver, the hon. secretary, showed that the membership had increased from 110 in 1920 to 321.

Association of Mining Electrical Engineers (London Branch).—The following is the programme of London meetings for the new session:—November 10th, 1925: Presidential address, by J. W. Gibson. December 8th: "Mining in Other Countries," by H. M. Morgans. January 12th, 1926: "Rescue Apparatus for Mines, including Demonstration of Certain Apparatus," by Siebe Gorman, Ltd. February 9th: "Mining Signalling Apparatus and Telephones," by O. D. Kennedy. March 13th: Visit to Chislett Colliery.—"Some Notes on the Electrical Plant at Chislett Colliery," by C. Dawson. April 13th: "Coal Screening, Crushing, Blending and Conveying Apparatus," by F. H. F. Hampton. The meetings will be held at the Engineers' Club, Coventry Street, W.1, at 6.30 p.m.

The Physical Society of London and The Optical Society.—Annual Exhibition.—The Councils of the above Societies have decided to extend the scope of the Exhibition of Electrical, Optical and other Physical Apparatus (January 5th, 6th and 7th, 1926) by including, in addition to the usual display by instrument makers, the following new classes of exhibits:—(*a*) Exhibits illustrating the results of recent physical research and improvements in laboratory practice. (*b*) Selected examples of effective lecture experiments. (*c*) Repetitions of famous historical experiments in physics. Accommodation for these will be provided in a part of the Imperial College distinct from that devoted to the trade exhibits, and a section of the catalogue will be allotted to them. No charge will be made for space or catalogue entries in the new classes, and the facilities of the Imperial College will be at the disposal of exhibitors. The object in view in inviting exhibits of classes (*a*) and (*b*) is to afford to teachers and research workers an opportunity for interchanging ideas and disseminating information on matters relating to their work in practical physics. The exhibits in class (*c*) will be of interest not only to the scientific worker, but to the general public, who will have an opportunity on the third day of attending the exhibition. Offers giving preliminary particulars should be addressed to the secretary of the Physical Society at the Imperial College of Science, South Kensington, as early as possible, and not later than November 16th.

Diesel Engine Users' Association.—Scottish Shale Oil.—A considerable amount of interest was taken in the paper on "The Scottish Shale Oil Industry," which was read by Mr. Edwin M. Bailey at the October meeting of the Association. The author pointed out that as the cost of mining and retorting the shale amounted to about 80 per cent. of the total cost of manufacture of the marketable products, in the Scottish industry at present, it was obvious that cheap shale and cheap retorting might be very important factors in the creation and survival of the new oil industry. In the discussion several speakers referred to the possibility of obtaining supplies of liquid fuel from shale deposits or coal in this country, and to the importance of doing everything possible to establish such a home-industry instead of remaining almost entirely dependent upon foreign imports of petroleum products.

Institution of Engineering Inspection.—At the meeting of the Institution to be held at the Royal Society of Arts, John Street, Adelphi, W.C., on Friday, November 13th, a paper will be read by Mr. W. H. Hatfield on "Modern Developments in Steel Resistant to Corrosion."

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

After 35 years' service in Liverpool and Manchester with the General Electric Co., Ltd., Mr. Fred Crawford, the Liverpool manager, has been presented with a gold cigarette case by the directors, and an illuminated address by his colleagues. The Liverpool staff gave Mrs. Crawford a rose bowl. The presentations were made at a dinner at the Adelphi Hotel, when Mr. J. H. Farthing, the northern district manager, took the chair.

Mr. W. Walker, managing director of Messrs. Baxendale Bros., Ltd., has been installed Worshipful Master of King George the 5th Lodge, No. 3514 Cheshire.

With further reference to the visit to this country of Mr. Forbes Mackay, the engineer and general manager of the Sydney (N.S.W.) Corporation electricity undertaking, we understand that he is now on his way. His visit is for the purpose of calling for tenders for plant required for the new power house, and he expects to arrive in November. The first section of the station will probably comprise 120,000 kW of plant. Mr. Mackay will on his arrival advertise for tenders and will be available at Messrs. Preece, Cardew & Rider's office, 8, Queen Anne's Gate, Westminster, S.W.1, for one or two months, to give information to firms on this side who propose to submit tenders in Sydney.

According to a dispatch from Adelaide to the *Daily Mail*, SIR FRANK HEATH, Secretary to the Department of Scientific and Industrial Research, London, has arrived in the *Nestor* to investigate the possibilities of Britain and Australia co-operating in the solution of scientific and technical problems affecting trade and commerce.

Indian Engineering just to hand understands that the six months' leave granted to Mr. P. HAWKINS, Chief Engineer, and Secretary to the Government of Madras, P. W. D., Irrigation, has been cancelled. Mr. Hawkins will remain as Chief Engineer for the hydro-electric development in Madras. The same contemporary states that Mr. SATYENDRA NATH RAY, M.Sc., who stood first in B.Sc. with First Class Honours in Physics, has been awarded the Tata Scholarship in Wireless of Rs. 15,000, to carry on researches in wireless and electricity at Faraday House, London. He recently left for England.

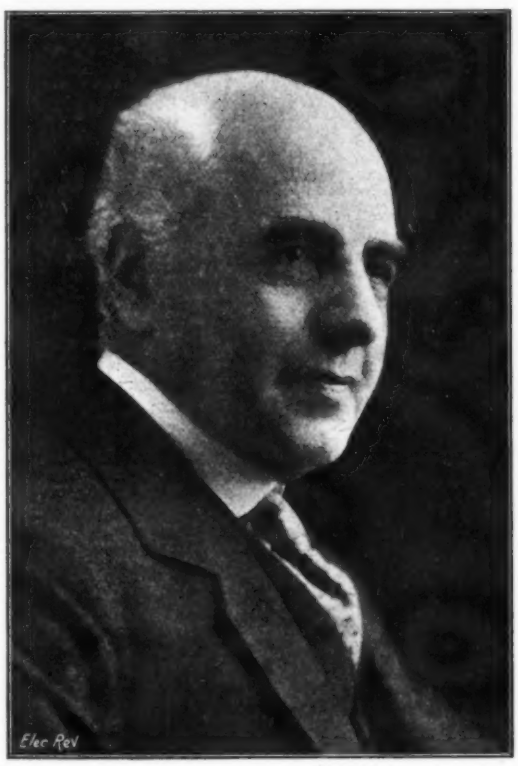
At a meeting of the Council of the University of Birmingham on October 7th, bound volumes for use in the Electrical Engineering Department were received from Mr. J. C. VAUDREY.

Candidates in the forthcoming municipal elections at Bradford include Mr. J. W. LONGLEY (Conservative), consulting electrical engineer, and vice-chairman of the Corporation Electricity Committee for some years past, in Allerton ward; and Mr. LOUIS JESSOP (Jessop & Boydell, Ltd., electrical contractors), who stands as a Liberal for the Great Horton ward.

Mr. C. H. ASTLE, of the Wrexham Corporation Electricity staff, has been presented by his colleagues with a Jacobean oak mirror on the occasion of his marriage.

Mr. Jos. H. QUICKE, A.M.I.Mech.E., recently went out from London to take up the position of general manager to the Madeira Supply Co., Ltd., general engineers and founders, Funchal, Madeira.

Mr. J. WILLIAM BURR, M.I.E.E., M.I.Mech.E., whose inaugural address to the Western Centre of the Institution of Electrical Engineers, of which he is the chairman, appears in abstract on another page of this issue, is the borough electrical engineer and manager at Swansea. He was born in London, and was educated and served his apprenticeship there, but much of his technical training was obtained on the Continent. Upon his return to England he took up a position at Kingston-on-Thames, but very shortly afterwards he received an appointment at the Deptford works of the London Electric Supply Corporation, where he remained for seven years. He



Elliott & Fry] [*London.*

Mr. J. W. Burr.

CHAIRMAN OF THE WESTERN CENTRE OF THE I.E.E.

left Deptford to enter service under Mr. John Young, manager of the Glasgow Corporation tramways undertaking, and spent two years there during the construction of the Pinkston power station. Later he came south to Reading and subsequently became deputy engineer and manager at Croydon, which office he resigned in 1914 to take up the post that he now holds at Swansea.

Mr. J. W. WARDLE, who has for 19 years been a designer at Newtons' Electrical Works at Taunton, is leaving to become the firm's first direct representative in Australia, and he has been presented by his colleagues with a leather travelling case fitted with toilet requisites.

Mr. B. ADAIR M. BOYCE, whose portrait is reproduced herewith, and who has been elected chairman of the East Midland Sub-Centre of the Institution of Electrical Engineers for the coming session, was educated generally at Jersey and the Bath Grammar School, and in mechanical and electrical engineering at the University College, London. In 1902 he joined the General Electric Co., Ltd., as an assistant designer at its Witton works, which post he vacated in 1911 in order to accept the

Ramsden] [*Leicester.*

Mr. B. Adair M. Boyce.

CHAIRMAN OF THE EAST MIDLAND SUB-CENTRE OF THE I.E.E.

position of chief assistant designer with the Brush Electrical Engineering Co. at Loughborough. A year later Mr. Boyce was appointed chief electrical designer by the same firm and this position he holds to-day. Mr. Boyce is an active member of the Electrical Research Association and is serving on several of its committees. Mr. Boyce is also an Associate of the American Institution of Electrical Engineers.

There were 40 candidates for the position of general manager and engineer of Wigan Tramways and Motor Department, rendered vacant by the death of Mr. W. Mayall Milnes. Some have been selected to appear before the Tramways Committee.

At a meeting of the Bradford Education Committee it was reported that Mr. H. J. B. CHAPPLE, Lecturer in Electrical Engineering at the Technical College, had tendered his resignation in order to take up a commercial appointment in London.

Obituary.—MR. D. I. DAWBARN.—We regret to learn from Messrs. A. Reyrolle & Co., Ltd., of the death which occurred on October 1st, in a motor accident at Milwaukee, Wisconsin, of Mr. David Inglis Dawbarn. Mr. Dawbarn left Messrs. Reyrolle's works last April, to take up his duties as American representative, and he has been rendering excellent service to the company. He was born in 1896. He was educated at Merchant Taylor's School, and took First Class Honours in the Oxford Senior Locals in 1913. He proceeded to the University of Liverpool, and there obtained First Class Honours in the examination as Bachelor of Engineering. After five years spent with the Forces during the war he helped Professor Marchant, D.Sc., for two years with research work for the Board of Scientific and Industrial Research, the results of this work being published in the *Journal* of the Institution of Electrical Engineers. In 1922, he joined Messrs. Reyrolle on a two years' Student Apprentice's Course, on the completion of which he was transferred to the sales department, where he was engaged as an assistant engineer in the contracts and estimates section, before being appointed representative for U.S.A. He was an Associate Member of the Institution of Civil Engineers and at the time of his death was awaiting his election as an Associate Member of the Institution of Electrical Engineers, of which he was a Student Member. He was also awarded one of the Students' Premiums of the I.E.E. for a paper read in 1924 on "Variable-Speed 3-Phase Commutator Motors." Messrs. Reyrolle testify to Mr. Dawbarn's consistent thoroughness and reliability and to the esteem in which he was widely held. The funeral took place in Milwaukee on October 5th.

Mr. A. Handford.—Mr. Alfred Handford, traffic and claims superintendent of the Sheffield Corporation tramways, passed away recently following a seizure. He was 63 years old, and he passed away on his birthday.

Prof. A. Gray.—We regret to learn that Prof. Andrew Gray, D.Sc., LL.D., F.R.S., Emeritus Professor of Natural Philosophy at the University of Glasgow, who succeeded Lord Kelvin at the University in 1899, has passed away. He was 78 years of age. We shall make further reference to his work and career in our next issue.

Mr. R. Ballantyne.—The death is reported of Mr. Robert Ballantyne, a director of Messrs. Stewarts & Lloyds, Ltd.

Captain H. R. Sankey.—At the funeral of the late Captain H. R. Sankey, past-president of the Institution of Mechanical Engineers, on October 7th, the Institution of Electrical Engineers was represented by its president, Mr. R. A. Chattock, M.I.E.E.

Mr. V. Stott.—The death occurred on October 7th of Mr. V. Stott, head electrician at the collieries of George Hargreaves and Co., Huncoat, Accrington. He was 32 years of age. It is stated that in the darkness he accidentally walked into a water pit and was drowned.

Mr. R. F. Halliwell.—We regret to record that Mr. Reginald Francis Halliwell, M.I.Mech.E., principal steam turbine designer to the British Thomson-Houston Co., Ltd., at Rugby, died on October 10th at the age of 54 years, after some weeks' illness, followed by an operation. Mr. Halliwell, after serving as engineer in the mercantile marine, joined Messrs. Willans & Robinson, Ltd., and subsequently Tubes, Ltd., and Messrs. Thornycroft, Ltd. He went to the B.T.-H. Co. in 1903.

New Companies Registered.

Pettigrew & Merriman (1925), Ltd. (208,795).—Registered as a public company on October 3rd with a nominal capital of £250,000 in 125,000 preference shares of £1 each and 500,000 ordinary shares of 5s. each. The cumulative preference shares are entitled out of the profits which the company determine to distribute to a cumulative preferential dividend of 7½ per cent.; subject thereto, the surplus is to be paid to the ordinary shareholders. Objects:—To acquire all or part of the business of mechanical and electrical engineers and wireless instrument manufacturers carried on by Pettigrew & Merriman, Ltd., in the United Kingdom and elsewhere, together with the whole of the assets and undertaking of Pettigrew & Merriman (Continental), Ltd., and to carry on the same and the business of manufacturers of electrical, wireless, and high-tension apparatus, valves, equipment, magnetic, and radioactive instruments, &c. Minimum cash subscription, £7. The directors are:—H. C. Rose, 67, Hervey Road, Blackheath, S.E.3, merchant; T. Pettigrew, 31, Little Heath, Charlton, S.E.7, electrical engineer; E. Merriman, Stanley House, Pitsea, electrical engineer; O. Brunet, 95, Avenue Mozart, Paris, engineer; P. Brunet, 95, Avenue Mozart, Paris, engineer; W. P. Mackintosh, 21, Kenilworth Court, Putney, S.W.15, kinema proprietor. Qualification, £500 stock or shares. Remuneration, £250 each per annum. Solicitors: Herbert Smith, Goss King and Gregory, 62, London Wall, E.C.2.

Nottingham Electrical Contractors' Trading Association, Ltd. (208,836).—Private company. Registered October 8th. Capital, £1,000 in £1 shares. Objects: To carry on in the U.K. or elsewhere all or any of the businesses of buying, selling, letting on hire, hire-purchase, or easy payment system of electrical appliances, installation, fitting, machinery, motor cars, taxicabs, tramcars, charabancs, motor lorries and wagons, and motor vehicles of all kinds, bicycles, coaches and carriages, agricultural implements and machinery, airships, aeroplanes and balloons, manufacturers of and dealers in wires, lamps, fittings, accumulators, batteries, dynamos, telephonic and telegraphic instruments, wireless goods, &c. The subscribers (each with one share) are:—R. B. Baggaley, 27, Tavistock Drive, Nottingham, chartered accountant; C. Thompson, 31, Burlington Road, Nottingham, chartered accountant. The first directors are not named. Secretary: C. Thompson. Solicitor: J. E. M. Crowther, 23, Abingdon Street, Westminster.

Euradic Electric Co., Ltd. (208,792).—Private company. Registered October 3rd. Capital, £1,000 in 2,000 founders' shares of 1s. and 900 ordinary shares of £1. Objects: To adopt an agreement with H. C. Pontet and Muriel I. Pontet to develop and turn to account the business referred to therein, to manufacture and deal in wireless, telegraphic and telephonic apparatus, machinery, conveniences, valves, electrical, magnetic and radio-active instruments, electricians, &c. The directors are:—H. C. Pontet, 4, Seymour Street, Euston, N.W.1, electrical engineer; Mrs. M. I. Pontet, 4, Seymour Street, Euston, N.W.1 (both permanent). Qualification, 50 ordinary shares. Secretary: A. E. Kent. Solicitors: Foster, Martindale and Clark, Millbrook Chambers, Camden Town, N.W.1.

McKenzie & Holland, Ltd. (208,915).—Private company. Registered October 9th. Capital, £100 in £1 shares. Objects:—To carry on the business of manufacturers of railway signals, locking apparatus, and safety appliances, mechanical engineers, and electricians, &c. The subscribers (each with one share) are:—H. G. Brown, "Four Winds," Bidborough, Kent, electrical engineer; R. Payne, 77, Braxted Park, Streatham Common, S.W.16, chartered accountant; B. H. Peter, 82, York Road, King's Cross, N.1, engineer. The first directors are to be appointed by the subscribers. No share qualification required. Solicitors: Linklaters and Paines, 2, Bond Court, Walbrook, E.C.4. Registered office: 82, York Road, King's Cross, N.1.

Official Returns of Electrical Companies.

Warnolite, Ltd.—Issue on September 26th, 1925, of £90 debentures, part of a series already registered.

Arrota Electrical and Motor Accessories Co., Ltd.—S. P. Child, of 36-37, Queen Street, E.C., was appointed receiver on July 15th, 1925, under powers contained in mortgage debentures dated May 11th, 1922.

Direct Spanish Telegraph Co., Ltd.—Particulars filed of £100,000 debentures authorised August 14th, 1925, charged on the company's undertaking and property, present and future, the whole amount being issued on October 1st, 1925.

Crampton & Co., Ltd. (109,328).—Return dated December 31st, 1924 (filed August 1st, 1925). Capital, £2,500 in £1 shares. All shares taken up. £2,500 paid. Mortgages and charges, nil.

Peterborough Electric Traction Co., Ltd. (74,562).—Return dated May 4th (filed September 16th), 1925. Capital, £60,000 in 6,000 preference and 6,000 ordinary shares of £5 each. 4,400 preference and 4,400 ordinary shares taken up. £42,000 paid. Mortgages and charges, £21,000.

H. P. Electrical Co., Ltd. (187,715).—Return dated September 15th, 1924 (filed March 12th, 1925). Capital, £1,000 in £1 shares. 654 shares taken up. £654 paid. Mortgages and charges, nil.

Keswick Electric Light Co., Ltd. (28,820).—Return dated April 9th (filed August 10th), 1925. Capital, £20,000 in 15,000 preference and 5,000 ordinary shares of £1 each. 3,420 ordinary shares taken up. £3,420 paid. Mortgages and charges, £10,100.

Edmundson's Electricity Corporation, Ltd. (52,013).—Return dated July 28th, 1925. Capital, £800,000 in 400,000 ordinary and 400,000 preference shares of £1 each. All shares taken up. £600,400 paid on 200,400 ordinary and 400,000 preference shares. £199,600 considered as paid on the remainder. Mortgages and charges £919,295.

Foster & Pullen, Ltd. (108,579). — Return dated August 21st, 1925. Capital, £5,000 in £1 shares. 4,436 shares taken up. £2,436 paid. £2,000 considered as paid. Mortgages and charges, £500.

Llangefni Electric Light and Power Co., Ltd. (111,909).—Return dated December 23rd, 1924 (filed August 26th, 1925). Capital, £3,000 in 2,750 preference and 250 ordinary shares of £1 each. 2,566 preference and 250 ordinary shares taken up. £2,566 paid. £250 considered as paid. Mortgages and charges, £2,400.

St. Helens Cable and Rubber Co., Ltd. (87,774).—Return dated May 27th, 1925. Capital, £100,000 in £1 shares. 84,000 shares taken up. £84,000 paid. Mortgages and charges, nil.

Walters Electrical Manufacturing Co., Ltd. (94,300).—Return dated July 28th, 1925. Capital, £18,000 in £1 shares. 16,875 shares taken up. £6,875 paid. £10,000 considered as paid. Mortgages and charges, nil.

Wark and District Electric Lighting Co., Ltd. (186,144).—Return dated May 14th, 1925. Capital, £1,500 in £1 shares. All shares taken up. £1,500 paid. Mortgages and charges, nil.

Presteign Electric Co., Ltd. (170,355).—Return dated May 15th, 1925. Capital, £5,000 in £1 shares. 630 shares taken up. £630 paid. Mortgages and charges, nil.

Blackburn, Starling & Co., Ltd. (61,302).—Capital, £12,000 in £1 shares. Return dated August 4th, 1925. All shares taken up. £8,100 paid. £3,900 considered as paid. Mortgages and charges, nil.

Vaughan Crane Co., Ltd. (61,526).—Capital, £150,000 in 50,000 preference and 100,000 ordinary shares of £1 each. Return dated September 4th, 1925. 16,780 preference and 53,578 ordinary shares taken up. £43,569 paid. £26,789 considered as paid. Mortgages and charges, nil. A further 100 preference shares were allotted, payable in cash, on September 7th, 1925.

Reason Manufacturing Co., Ltd. (64,701).—Capital, £52,500 in 5s. shares (200,000 preference and 10,000 ordinary). Return dated April 7th, 1925. 92,000 preference and 10,000 ordinary shares taken up. 5s. per share paid on 9,397 preference shares. £2,349 5s. paid. £23,150 15s. considered as paid on 82,603 preference and 10,000 ordinary shares. Mortgages and charges, £14,000.

Kalgoorlie Electric Tramways, Ltd. (73,127).—Capital, £250,000 in £1 shares. Return dated August 13th, 1925. All shares taken up. £250,000 paid. Mortgages and charges, £132,980.

Chili Telephone Co., Ltd.—Capital, £750,000 in £5 shares. Return dated July 23rd, 1925. All shares taken up. £431,000 paid. £319,000 considered as paid. Mortgages and charges, nil.

Royce, Ltd.—Capital, £170,000 in £1 shares (70,000 preference and 100,000 ordinary). Return dated September 7th, 1925. 34,955 preference and 72,487 ordinary shares taken up. £27,461 paid (being £1 per share on 4,955 preference and 6 ordinary and 15s. per share on 30,000 preference. £79,981 considered as paid (being £1 per share on 72,481 ordinary and 5s. per share on 30,000 preference). Mortgages and charges, £21,520 12s.

Newquay Electric Light and Power Co., Ltd. (85,451).—Capital, £15,000 in £1 shares. Return dated January 14th, 1925 (filed June 3rd). 18,124 shares taken up. £2,944 paid. £10,180 considered as paid. Mortgages and charges, £15,400.

Anglo Electric Co., Ltd.—Particulars filed of £3,000 debentures authorised September 25th, 1925, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

City Notes.

Reports and Meetings of Electrical Companies; Dividend Results, &c.

Argentine Light and Power Co.

The directors' report for the year ended March 31st, 1925, states, according to the *Financial News*, that the financial years of each of the company's subsidiaries in Argentina close on March 31st. Owing to the growth of the businesses it was found impossible to complete the audit of local accounts and have them dispatched to London for incorporation in this company's accounts in time to permit of the annual meeting being held before the summer vacation, as has been customary. "During the year the balance of share capital of the Argentine Tramways and Power Co., Ltd., was acquired. Whole of share and loan capital of that company, as also of Cordoba Light and Power Co. and Cordoba (Argentine) Electric Tramways Construction Co., Ltd., is therefore now the property of this company. Owing to improvement in the average rate of exchange on London, the loss on remittances was not so great as in the previous year, being £29,499, compared with £41,538. The sum received by way of interest and dividends from undertakings owned and other investments, together with sundry other receipts, totalled £192,545. After providing for administration expenses, interest on debenture stock, loss on exchange, and taxes, the profit and loss shows credit of £108,306; plus £13,766 brought forward, making £122,072. There is set aside for

debenture stock redemption £12,043, for share capital redemption £5,000, for general reserve £25,000." The directors recommend a dividend at the rate of 2½ per cent. on 952,211 ordinary shares for the year (after deduction of tax), leaving to be carried forward £15,133. The meeting is taking place in London to-day (Friday).

West India and Panama Telegraph Co., Ltd. The directors' report for the year 1924 states that the receipts amounted to £94,995 and the expenses to £90,106, leaving £4,889. This has been placed to reduction of the debit balance brought forward, which at December 31st, 1924, amounted to £77,190. The Government competitive system of cables and wireless was opened on December 1st, 1924. Annual subsidies of £26,300 ceased on September 30th, 1924, but, by request of the Pacific Cable Board, the company continued its service between those two dates, receiving remuneration for doing so; consequently the new competition is not reflected in the year's results. In November last a circular was sent to share and debenture holders conveying an offer made by the Cuba Submarine Telegraph Co. to purchase shares and debentures of the company. The offer was accepted by shareholders whose holdings exceeded the necessary majority of 80 per cent., as stipulated by the Cuba Submarine Co. The whole of the outstanding debentures have also been acquired by the Cuba Submarine Co. According to the *Financial News*, the former directors, with the exception of the nominee of the International Ocean Telegraph Co., resigned as at December 31st, 1924, and their places have been filled by members of the board of the Cuba Submarine Co.

Stock Exchange Notices.—Dealings in the following have been specially allowed by the Committee under Rule 159:—

Brisbane Tramway Trust.—£500,000 5¼ per cent. Brisbane Tramway stock, 1944-54, issued at 98½ per cent., partly and fully paid.

Shropshire, Worcestershire, and Staffordshire Electric Power.—10,650 6 per cent. cumulative preference shares of £1 each, fully paid, Nos. 1,135,206 to 1,145,855.

Stewarts & Lloyds.—8,725 deferred shares of £1 each, fully paid, Nos. 2,671,159 to 2,679,883.

Belgian Companies.—In order to extend their sphere of operations to meet the ever-increasing demand, several of the electricity supply undertakings in Belgium have lately made additions to their capital. Thus, the Société d'Electricité du pays de Liége has invited subscriptions for 20,000 new preference shares of 500 fr. each and 20,000 special shares of a similar value, a total of 20 million fr.; and the Société d'Electricité du Bassin de Charleroi for 1,000 new ordinary shares of 500 fr. offered at 800 fr. each.

United River Plate Telephone Co., Ltd.—The directors have decided to issue 152,000 ordinary shares of £5, ranking *pari passu* with the existing ordinary shares, and they are being offered at par to the holders of ordinary shares registered September 25th in the proportion of one new share for every complete multiple of five existing ordinary shares held. The new shares will not participate in the interim dividend to be paid in November in respect of 1925.

Brisbane Tramway Trust.—The Trust has been offering for public subscription in this country an issue of £500,000 5¼ per cent. Brisbane Tramway Stock 1944-1954, at £98 10s. per cent., the proceeds to be applied in the erection of new tramway sheds and for the necessary extensions to the system. The list was to close on or before last Monday.

Hurst, Nelson & Co., Ltd.—After placing to reserve £10,000, the directors recommend a dividend of 2s. and a bonus of 6d., both less tax, on the ordinary shares, leaving, after reserving £16,000 for interim ordinary dividend on May 15th next, £16,091 to be carried forward.

United Electric Tramways Co. of Caracas, Ltd.—According to the *Financial Times*, the net revenue for the year ended June, 1925, was £23,011, plus £17,741 brought forward. A dividend of 10 per cent., less tax, is recommended, leaving £22,796 to be carried forward.

Dundee, Broughty Ferry and District Tramways Co., Ltd.—It is proposed to pay dividend on ordinary shares at the rate of 7 per cent. per annum for the year, less tax, and to place to renewals fund £1,500, leaving to carry forward £145.

Western Electric Distributing Corporation, Ltd.—The dividend recommended by this company in its report for the year ended June 30th, 1925, makes a total of 10 per cent. on the ordinary shares, not 8 per cent. as stated in our last issue.

Anglo-American Telegraph Co., Ltd.—Interim dividends for the quarter ended September 30th: 15s. per cent. on the ordinary stock and £1 10s. per cent. on the preferred stock, less tax at 4s. in the £.

Oriental Telephone and Electric Co., Ltd.—The directors have declared interim dividends of 3½ per cent., less tax, on the 7 per cent. cumulative preference shares, and 4 per cent., free of tax, on the ordinary shares.

Yates & Thom, Ltd.—A dividend of 7½ per cent., less tax, on the ordinary shares for the year is recommended, carrying forward £15,554.

Monte Video Telephone Co., Ltd.—Final dividend of 5 per cent., less tax, making 7 per cent., less tax, for the year ended July 31st.

Babcock & Wilcox, Ltd.—Interim dividend of 5 per cent., free of tax.

Indo-European Telegraph Co., Ltd.—Interim dividend at rate of 5 per cent. per annum, free of tax.

Stocks and Shares.

MONDAY EVENING.

THE outstanding market in the Stock Exchange remains that for rubber shares, but there is a good deal of business going on in other departments, and, taking it all round, the Stock Exchange can scarcely complain of being unemployed. The excitement over rubber shares appears to have given something of a fillip to the speculative spirit. Any industrial shares are readily taken if they offer the prospect of capital improvement. People once more are begging their brokers to buy them something that stands a chance of an early rise, frankly declaring that they, the purchasers, disregard dividend considerations and put capital appreciation before anything else. This speculative flame serves to brighten the prices in a good many sections of the Stock Exchange, and it has its counter-effect amongst investment securities through the necessity for money to be raised from the sale of first-rate stocks by those people who are putting capital into shares of a more risky order.

On the other hand, investment pure and simple is fortified in the knowledge of a 4 per cent. Bank Rate and of the easy money conditions that this ensures. No doubt there will be the usual autumn rush of new issues, though fresh borrowing has been, during the past month or two, mercifully slow. It is known that the Government policy aims at conversion of short-dated stocks into some other security that shall mature later on, which means that there will be fairly constant offers of British Government security in exchange for existing stocks, a factor which lends its weight to keeping prices down amongst the investment securities. Nevertheless, the first-class Industrial debentures and preferences, for instance, such as those of the electrical and telegraph market, remain in such steady demand as to render the floating supply a very modest one, and, in spite of all the temptations to gamble, there are investors who refuse to be drawn away from the paths of safety and 5 per cent.

North Metropolitan Electric 6 per cent. preference shares have strengthened to 1¼. Westminsters are better at 44s. 6d. Demand for South London led to 1/16 rise to 2 9/16. Save for these slight changes, the London list shows no alteration.

With perseverance worthy of a noble cause, the Southern Counties Electric Light & Power Supply, Ltd., continues to push its offers of debentures and participating preference shares. The first director's name on the application form is that of Sir Charles B. H. Soame, Bart. The company's covering letter is dated July, 1925, but there is a rubber-stamped "Sep.," above the earlier, printed date. The same application is used as that which accompanied the offer of the same issues last April, the only difference being that the latest form is printed upon paper coloured a vivid green.

Brazilian Tractions have gained another 3 points, and now stand at 77. The buying is still rumoured to be on behalf of people said to desire control of the company. Anglo-Argentine 5 per cent. debenture hardened to 77¼. Argentine Light and Power ordinary have re-entered the dividend list, after an absence of 13 years. It is proposed to pay 2½ per cent., and this has induced a certain activity into the shares, which have risen to 12s. The company's 7 per cent. preference braced up to 20s. 6d. The British Columbia Electric Railway announces details of an ambitious programme for establishment of a power scheme, at a total cost of about 30 million dollars. Prices of the company's stocks are better on the idea that the proposals may involve an issue of new capital upon terms likely to give a bonus to present proprietors. It happens sometimes that the actual offer of stock tends to induce sales on the part of shareholders who exchange from the old into the new securities.

In the group of cable stocks, the quotation ex dividend of Eastern Extensions and Eastern Telegraph ordinary served to bring in a few buyers, and part of the deductions was recovered. Great Northerns are 5s. higher. Indo-Europeans remain at 42½, unaffected by declaration of the usual 5 per cent. tax-free interim dividend. United River Plate Telephones rallied to 7 1/16. Animated dealings in the new shares have resulted in an advance to 38s. premium. Canadian Marconis attract a good deal of attention around 7s. The parent shares are a quiet market again.

Babcock & Wilcox have declared an interim dividend of 5 per cent. free of tax, and the price keeps steady at 2½. Iron and steel issues are rather better, the market recovering from the unexpected postponement of the interim dividend payment upon Armstrong's junior preferences. Johnson & Phillips fell back to 46s. 3d. British Insulated rose sharply to 70s. buyers, a brisk demand coming upon a market bare of supply. Henley's advanced to 3¼. Edisons can be bought at 8s. or a little cheaper. Brush have gone back to 22s. and General Electrics to 26s., both being 1s. down on the week.

Metropolitan Consolidated gained 2, to 70¼, but the recent rise in Districts has brought in profit-takers: the price eased off to 44. Underground Electrics are firm. Home Railway stock maintains a tolerably steady front, although a good deal has been sold by tired holders who have turned the proceeds into rubber shares. The market in these latter has received something of a check to its buoyancy owing to talk of early permission being granted to the companies to accelerate their production. This led to selling by speculators in the raw material and to a sympathetic, though slight, reaction amongst rubber shares.

Share List of Electrical Companies

	Nom. £	Dividend. 1923.	1924.	Price Oct. 12. 1925.	Rise or fall.	Yield p.c.
Home Electricity Companies.						
Bournemouth and Poole	1	18	14	2½	—	4 15 4
Brompton Ordinary	1	10	10	1¾	—	*5 14 3
Charing Cross Ordinary	1	14½	15	10/-	—	6 2 5
do. do. 4½ Pref	1	4½	4½	17/6	—	5 2 10
Chelsea	1	12	12	1¾	—	6 8 0
City of London	1	15	15	46/3	—	6 4 4
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	28/6	—	5 12 4
County of London	1	15	15	57/-	—	5 5 3
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Edmundson's Ordinary	1	7	7	22/-	—	6 7 3
do. 7% Pref.	1	6	7	21/6	—	6 10 3
Elec. Supply Corporation	1	10	10	31/3	—	6 8 0
Kensington Ordinary	5	14	15	19¾	—	5 16 8
Lancs. Light and Power	1	7½	7½	26/-	—	5 15 5
London Electric	1	10	10	34/-	—	5 17 8
do. do. 6% Pref.	5	6	6	5½	—	5 7 10
Metropolitan	1	10	11	39/4	—	5 11 4
do. 4½% Pref.	1	4½	4½	17/6	+6d.	5 2 10
Midland Counties	1	5½	6	22/9	—	5 5 6
Newcastle-on-Tyne Ordinary	1	6	7	1¼	—	6 4 5
do. 5% Pref.	1	5	5	18/-	—	5 6 8
do. 7% Pref.	1	7	7	24/6	—	5 14 3
Notting Hill 6% Pref.	10	6	6	9½	—	6 6 4
North Met. Elec. 6% Pref.	1	6	6	22/6	+6d.	5 6 8
St. James' and Pall Mall	5	17½	17½	14¼	—	5 17 8
South London	1	15	15	2⅞	+ 1/16	5 17 1
South Metropolitan Pref.	1	7	7	1¼	—	5 12 0
Urban Ordinary	1	4	4	18/3	—	4 7 8
do. 5% Pref.	1	6	6	19/6	—	6 3 1
Westminster Ordinary	1	15	15	44/6	+6d.	6 14 10
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	1	—	7 10 0
Yorkshire Elec.	1	8	8	29/6	—	5 8 6
Home Rails.						
Central London Ord. Assented Stock	4	4		66	—	6 1 3
Metropolitan	4	5		70½	+2	7 1 10
do. District	3½	3½		44	— ½	7 19 1
Underground Electric Ordinary	10	Nil	Nil	2¼	—	Nil
do. do. "A"	1/-	Nil	Nil	6/6	—	Nil
do. do. Income Bonds	6	6		97	—	*6 3 9
Telegraphs and Telephones.						
Anglo-Am. Tel. Pref. Stock	6	6		109½	—	5 17 1
do. Def.	1½	1½		23⅞	—	6 6 4
Automatic Telephone	1	3	6	47/6	—	2 10 7
Chili Telephone	5	6	5	5⅞	—	*4 7 0
Cuba Sub. Ord.	10	5	5	6¼	—	8 0 0
Eastern Extension	10	10	10	17½xd	+ ½	*5 16 9
Eastern Tel. Ord. Stock	10	10		170½xd	+1½	*5 17 4
Globe Tel. and T. Ord.	10	10	10	17⅜	—	*5 13 4
do. do. Pref.	10	6	6	10⅝	—	5 10 4
Great Northern Tel.	10	22	22	33¼	+ ½	6 12 3
Indo-European	25	7	8½	42½	—	*5 2 5
Marconi	1	10	10	1 7/16	—	6 19 2
Marconi Marine	1	10	7½	⅞	—	8 11 6
Oriental Telephone Ord.	1	12	12	2 1/16	—	*5 16 4
United R. Plate Tel.	5	8	8	7 1/16	+ 1/16	5 13 3
Western Telegraph	10	10	10	16⅛	—	*6 4 0
Home and Foreign Trams, &c.						
Anglo-Arg. Trams First Pref.	5	5½	5½	3⅜	—	8 3 0
do. do. 2nd Pref.	5	6	6	3⅜	—	8 17 10
do. do. 5% Deb. Stock	5	5		77½	+1	6 9 0
British Electric Traction Ord.	6	6		121½	+ ½	4 18 9
do. do. 6% Pref.	6	6		107	—	5 12 2
Brazil Traction	100	4	4	77	+3	5 4 0
Brit. Columbia Elec. Rly. Pcs. Stock	5	5		89½	+1	5 11 9
do. do. Preferred	96/-	96/-		92½	+1	*5 3 0
do. do. Deferred	129/5	129/5		112½	+1	*5 15 4
do. do. Deb.	4¼	4¼		77½	—	5 9 8
Lond. & Sub. Trac. 5% Pref.	1	2½	Nil	4/6	—	Nil
London United Tram. Deb. Stock	4	4		42½	—	9 8 4
Mexico Trams, 5% Bonds	—	5	5	63½	—	7 17 6
Mexican Light Common	100	Nil	Nil	32	-1	Nil
do. Pref.	100	Nil	Nil	12	-1	Nil
do. 1st Bonds	—	5	5	60½	-3	7 3 11
Yorkshire (West Riding)	1	5	—	18/9	—	5 6 8
Manufacturing Companies.						
Babcock & Wilcox	1	12	12	2½	—	*4 16 0
British Aluminium Ord.	1	5	10	33/9	—	5 19 5
British Elec. Transformer Pref.	1	Nil	7	1	—	... ...
British Insulated Ord.	1	15	15	3½	+ 1/16	4 5 9
Brush Ord.	1	10	10	22/-	-1/-	7 13 10
Callenders	1	15	15	3 7/16	—	4 14 1
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	⅜	—	... ...
Edison-Swan	4/-	10	10	8/-	—	5 0 0
do. 5% Deb. Stock	5	5		80½	—	6 4 3
Electric Construction	1	10	10	30/-	-6d.	6 13 4
Enfield Cable, Pref.	1	7½	7½	1¼	—	6 0 0
English Electric	1	5	5	17/3	—	5 15 3
do. do. Pref.	1	6	6	20/-	—	5 17 1
Gen. Elec. Pref.	1	6½	6½	23/9	—	5 9 5
do. Ord.	1	5	7½	26/-	-1/-	5 15 5
Henley	1	15	16	3½	+ 1/16	4 18 6
do. 4½% Pref.	5	4½	4½	4¼	—	5 6 0
India-Rubber	1	5	5	1 1/16	—	*4 14 1
Johnson & Phillips	1	10	10	47/-	-2/9	4 5 1
Met-Vickers, Ord.	1	8	8	22/4	—	7 2 3
do. Pref.	2	8	8	2¾	—	6 14 9
Siemens Ord.	1	—	7½	29/6	+6d.	5 1 8
Telegraph Construction	12	20	20	20½	—	4 10 0

* Dividends paid free of Income Tax.

Market Quotations for Chemicals and Metals.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general and they may vary according to quantities and other circumstances.

CHEMICALS, &c	Price October 13th.	Fortnight's Inc. or dec.
a Acid, Oxalic per lb.	6½d.	...
a Ammoniac, Sal per ton	£60	...
a Ammonia, Muriate (large crystal) "	£53	...
a Bisulphide of Carbon "	...	...
a Borax "	£35	...
a Copper Sulphate "	£35 10s.	...
a Potash, Chlorate per lb.	4d. to 4½d.	...
a " Perchlorate "	5½d.	...
a Shellac per cwt.	£15 15s.	...
a Sulphur, Commercial "	£7 15s.	...
a " Roll "	£7 15s.	...
a Soda, Chlorate per lb.	3½d. to 3¾d.	...
a " Crystals per ton	£5 to £5 5s.	...
a Sodium Bichromate, casks per lb.	4d.	...
METALS, &c.		
b Aluminium, Ingots per ton	£120 to £125	...
b " Wire per lb.	1/9 to 2/6*	...
b " Sheet "	1/6 to 2/-	...
p Babbitt's Metal and Anti-friction Metal—		
Grade I per ton net	£249	£20 inc.
Grade II " "	£178	£14 inc.
Grade III " "	£101	£6 inc.
c Brass (rolled metal 2" to 12" basis) per lb.	10½d.	½d. inc.
c " Tubes (solid drawn) "	1/- to 1/0½	...
c " Wire, basis "	10⅜	½d. inc.
c Copper Tubes (solid drawn) "	1/1½	...
c " Bars (best selected) per ton	£91	£1 dec.
c " Sheet "	£91	£1 dec.
c " Rod "	£91	£1 dec.
d " (Electrolytic) Bars "	£68	10s. inc.
d " Sheets "	£143 10s.	...
d " Wire Rods "	£78	10s. inc
d " H.C. Wire per lb.	9 1/32d.	½d. inc.
f Ebonite Rod "	2/3 to 2/4	...
f Sheet "	2 3to 2/6	...
a German Silver Wire "	2/3	...
h Gutta-percha, fine "	9/9	...
h India-rubber, Para fine "	3/1½	1d. inc.
f Iron Pig (Cleveland Warrants) per ton.	nom.	...
f " Wire, galv. No. 8, P.O. qual. "	£21	...
g Lead, English Pig "	£40 10s.	...
g Mercury per bot.	£13 10s.	5/- to 10/- inc.
e Mica (in original cases) small per lb.	8d. to 4/-	...
e " " medium "	4/- to 8/-	...
e " " large "	10/- to 20/- & up.	...
p Phosphor Bronze, plain castings "	1/9½	...
p " " drawn bars & rods "	1/8	...
p " " rolled strip & sheet "	1/22½	...
p " " wire "	1/32	...
e Platinum per oz.	£36	...
d Silicium Bronze Wire per lb.	1/0½	...
r Steel, Magnet, in bars "	7½d.	...
e Tin, Block (English) per ton.	£277 5s. to £277 15s.	£12 5s. to £12 10s. inc.
a " Wire, Nos. 1 to 16 per lb.	4/1	2d. inc.

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
j Richard Johnson & Nephew, Ltd.
m P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Paisley Association of Electrical Engineers.—A large number of the members of the Paisley Association of Electrical Engineers met in Gibson's Tea Rooms on October 6th to hear Mr. James Neil give his presidential address on the electric wiring of houses. He emphasised the importance of building construction as a part of the training of apprentices, as it was very necessary that wiremen should have a knowledge of this subject. Mr. Neil dealt in a very practical way with every aspect of house wiring, giving his experience and knowledge of a subject on which he was well qualified to speak. The members present, says the *Paisley Daily Express*, were very much interested to hear all the different points raised, and a discussion took place after tea had been served, and was entered into with much enthusiasm by Messrs. Humphriss, Heys, Scott, Bruce, W. Blair Smith, Adam, Graham, Dodson, and Young. A vote of thanks to Mr. Neil for his very able paper was proposed by Mr. Barbour.

The Illumination of Firpo's Hotel, Calcutta.—In the lighting of the recently-opened Louis XVI ballroom of Firpo's Hotel, Calcutta, a highly original effect has been achieved. Each shade contains six Osram colour-sprayed lamps and one central 200-watt Osram clear gasfilled lamp, the latter on an entirely separate circuit and used for ordinary illumination only. A specially designed bank of switches, driven by a small G.E.C. motor, operates the six colour-sprayed lamps, producing the striking effect of revolving coloured lights. The installation was a great success, and was described in the local Indian Press as something unique for Calcutta. We understand, in addition, that four spotlights, a central prismatic mirror-bowl, and a specially designed flashing sign carried out in Osram daylight blue sign type lamps have since been installed.

Electrical Exhibitions and Showrooms.

Recent Developments in Local Undertakings.

WE refer in a leading article in this issue to the optimism with which we look forward to the progress to be made in electrical operations in this country during the coming season, which is fostered by our observations of the electrical exhibitions which are in progress and of the enterprise which is being shown by some electrical undertakings in the development of permanent electrical show and demonstrating rooms.

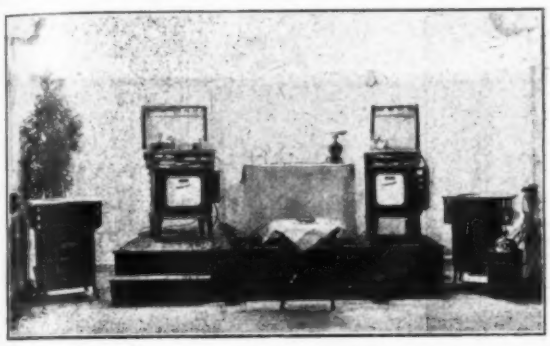


Fig. 1.—Demonstration Platform, Swansea.

We are able to give below some account of what is being done in the directions indicated in connection with some of the recent developments.

The electrical showroom of the past was a place where consumers or prospective consumers, if they happened to be near at hand, during the payment of the quarterly bill, for instance, could see how effectively and perhaps efficiently electric lighting could be introduced into the showroom. It is encouraging to see to-day showrooms which prove a real attraction to the public and a driving force in promoting the utilisation of electrical energy. The modern showroom or demonstrating theatre brings home to the consumer how effectively and economically electricity can be applied for its numerous uses in his home, office, works, &c. He receives valuable education and is inspired, by the interest and attractiveness of the place and by the courtesy and competency of the attendants, with a desire to impart his knowledge at the first opportunity to his friends.

The tendency prevailing is also to combine the showrooms and the demonstrating rooms, so that a demonstration can be given to a prospective purchaser at short notice while he is "on the spot" and his interest in the subject is at its height. Some of the modern showroom buildings are also far from lacking in fine external appearance and attraction, and to the Hackney and Swansea electricity undertakings our congratulations are due on their splendidly-designed premises.

The undertakers and promoters of the exhibitions and showrooms to which we refer below are to be congratulated on the results of their enterprise. Another encouraging point is the willingness of manufacturers to co-operate with the local undertakings by lending the necessary apparatus and equipment for exhibition and demonstration purposes.

The official opening of the North-East Coast Lighting Service Bureau, Dial House, Northumberland Street, Newcastle-on-Tyne, by the Lord Mayor of Newcastle, Councillor Walter Lee, J.P., on October 13th, was another event, the development of which we look forward to with interest.

The New Swansea Showrooms.

The new showrooms and offices of the Swansea Corporation Electricity Department, which were opened by the Mayor of Swansea on September 17th, *vide* ELECTRICAL REVIEW, September 25th, are contained in a four-storey building situated in Oxford Street, a main thoroughfare of the town. The building contains some prominent features in structure and design, and some idea of its magnificent frontage can be gained from the view of the premises shown in fig. 2; the original photograph was, of course, taken after dark so that the results of the very effective flood lighting of the building are depicted. The showroom proper occupies the ground floor, and is provided with an imposing main entrance, double doors set well back being arranged centrally between spacious, well illuminated curved windows, forming an attractive porchway of considerable dimensions. In the interior of the showroom fittings and apparatus of every description are exhibited amid pleasing and decorating surroundings. A basement to the building, which was previously used as a restaurant, is now equipped as a lecture theatre, and it is suitably equipped for the purpose of giving demonstrations. It will accommodate between 150 and 200 persons. Fig. 1 shows a platform on which the demonstrations are given, and it will be noticed that ample room is given for cooking demonstrations. Since the inauguration of the showrooms several cookery demonstrations have been given, and the accommodating capacity of the basement has been severely taxed.

Several exhibits are arranged in various parts of the show and demonstration rooms, illustrating the uses and advantages of electricity for specific purposes. A fully furnished dining room is arranged with modern pendant and pedestal lighting. Another corner or portion of the premises is fitted out as an

Fig. 2.—Exterior of the Swansea Premises.

up-to-date bathroom equipped, of course, with an electrical geyser. Fig. 4, p. 632, shows a part of the premises set out as an "all-electric" kitchen. Another feature is the representation of a linendraper's showrooms illustrating the value of electric lighting in that direction.

Offices accommodating both the technical and clerical staffs are arranged on the three upper floors of the building.

The New Hackney Demonstration Halls.

Simultaneously with the inauguration of the new showrooms at Poplar, his Worship the Mayor of Hackney, Councillor E. J. Farmer, J.P., performed the opening ceremony of the new palatial demonstration halls and offices of the Hackney electricity undertaking at Lower Clapton Road, on October 8th. In the layout of these premises the principles for the promotion of the business interests of electricity suppliers and contractors have been borne in mind. The building consists of a central section rising to a height of 55 ft., with single windowed wing towers supporting it on each side. On the ground level a loggia extends the full length of the centre section, covering the two main show windows and the centrally placed main entrance leading to a large vestibule hall. To the right and left of the vestibule are two spacious showrooms where fittings of every description are effectively displayed. A demonstration hall which will accommodate comfortably 100 persons, is situated beyond the vestibule at a slightly lower level. Show-

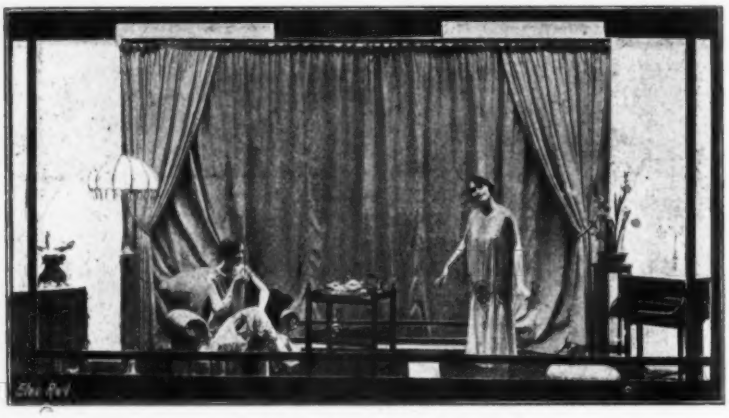


Fig. 3.—Hackney Display Window.

cases are arranged around this room and contain excellent displays and the necessary equipment for lecture and kinematograph demonstrations. By the side of this compartment are arranged a suite of model rooms where the actual demonstration of electrical appliances can be given in their normal surroundings, thus creating the desired atmosphere. One of these is a sitting room provided with all the latest home comforts, complete with a window and a garden scene: Another room is furnished and electrically fitted as a bedroom; while an electrically equipped kitchen and a bathroom similarly fitted up are included in the suite. A factory and workshop demonstration room is an important feature of the halls; this is designed

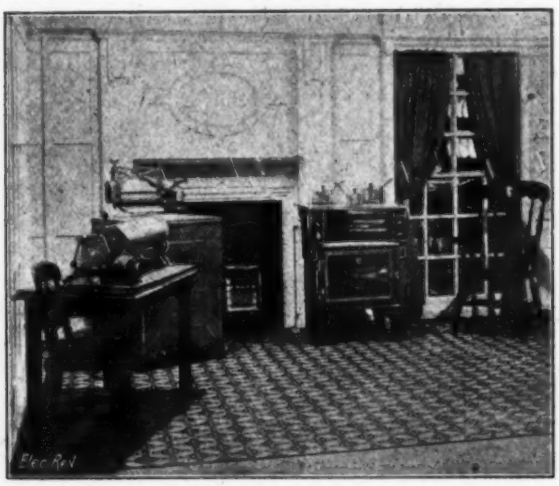


Fig. 4.—All-Electric Kitchen, Swansea.

for the suitable demonstration of workshop appliances. The building is one of four storeys. The first floor contains the offices, &c., the mains and meter departments are accommodated on the second floor and on the third floor is a suite of electrically equipped rooms provided for the caretaker.

Fig. 3 shows one of the display windows; it is equipped with the "Gecoray" system of lighting and includes a number of colour screens. The installation is connected up to a flasher and five-colour mixing effects are obtained. In addition, three flood lights are fitted with colour screens; these illuminated for a few moments make the sixth movement in the cycle of operations. Many manufacturers have given valuable assistance to the department in connection with the equipping and stocking of the premises.

At the King's Hall, Hackney Baths, where the inaugural speeches were made, there was an attendance of over 1,000 persons, including Mr. Joseph Richmond, who was chairman of the Borough Electricity Committee twenty years ago.

Councillor G. Green, the present chairman of the Committee, in his opening speech, said that the undertaking was now fourteen times bigger than it was twenty years ago. For 24 years the various electricity committees had been perfecting their methods of generation, making necessary extensions to the works, installing new machinery, and re-arranging tariffs to meet the needs and conditions of the area they served. To-day the undertaking was in the proud position of being first in its group of generating stations for fuel economy.

Councillor Davy (vice-chairman of the Electricity Committee) in handing the Mayor a special key of the new building, said that if the people of the Borough would visit the showrooms there would be no difficulty in converting them to the use of electricity.

The Mayor, in reply, said that electricity had revolutionised the means of transport, it had added very greatly to the efficiency of workshops and factories and it had added comfort to the homes of the people. He concluded with a tribute to the work of Mr. L. L. Robinson, the borough electrical engineer. At the conclusion of the proceedings a large number of visitors were conducted throughout the new building.

Additional Showrooms at Poplar.

The official opening of the new and additional showrooms and offices of the Poplar Electricity Department took place on Thursday of last week, when Mr. J. W. Beauchamp, director of the British Electrical Development Association, officiated. The inauguration was of particular interest in that it marked the twenty-fifth anniversary of the commencement of electricity supply in Poplar. The new premises, Electric House, 65-67, Bow Road, are situated on an important corner site opposite the Bow Road District Railway station. They form the third set of showrooms of the undertaking. In July, 1911, the first offices and showrooms of the undertaking were opened at 121, East India Dock Road, to improve the facilities for consumers and the development of service to prospective customers. Larger premises were taken and opened early in 1919 at 97-99, East India Dock Road, to accommodate the staff necessary to cope with the increased volume of business. The recent provision forms a new departure which is calculated to improve business facilities with consumers, particularly in the northern district of the borough, and to promote confidence with present and prospective consumers.

Forty feet of pavement separates the building line of the premises from the curb, and the frontage available for window display amounts to approximately 120 feet. Five floor levels

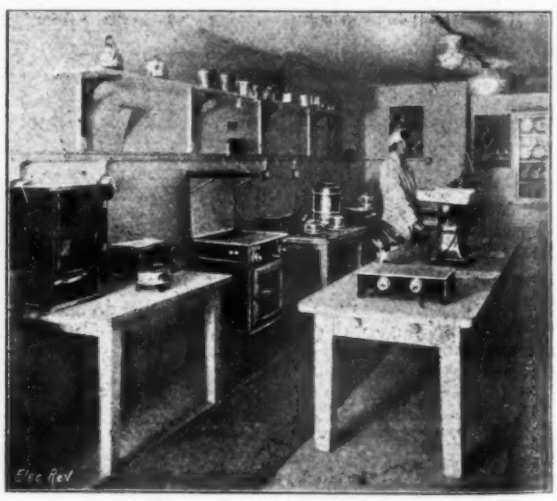


Fig. 5.—Demonstration Room, Poplar.

are included in the premises, excluding a basement, which is to be used for demonstration and lecture purposes; this has a seating capacity for 100 people. Fig. 5 shows some of the cooking equipment arranged for demonstrations in the basement. The ground floor constitutes the main show room, which is bordered on two sides by the display windows. Fig. 6 shows the main entrance and one of the windows. These are provided with modern systems of lighting, a special feature being the equipment of a special demonstration window in which incorrect and correct methods of illumination are depicted, fig. 6. Nine examples are shown and include lighting with coloured, flood and spot-light effects. Each method is automatically switched on in turn and an illuminated indicator board informs the observer as to the style of lighting in each case. A special feature of the demonstration compartment is the provision of cubicles in which the effects of various lighting fittings and

fires can be easily seen. Some of these cubicles are shown in fig. 7.

All types of fittings and apparatus are displayed, most of which have been provided by several of the manufacturers of this country for exhibitional purposes. Among the special items of interest is the bread-wrapping plant installed at the instance of Messrs. Young & Burton, Ltd., of Stratford. Sausage making by the Empire Provision Co. with "Hobart" and "Dayton" machines is also a feature, while an interesting exhibit is the "Little Marvel" potato peeler of Messrs. Mabbot and Co., Ltd. Great interest is shown in an exhibit of Mr. Herbert, of the Benjamin Electric Co., Ltd., which illustrates lighting devices from the "Aladdin" oil lamp to modern electric lighting. It is interesting to note that it is the intention of the undertaking to give demonstrations in the de-frosting of meat,

Fig. 6.—Poplar Show Windows and Entrance.

apart from bread baking, &c. Industrial exhibits such as electric cutting and grinding tools are given by Messrs. Wolf. All the usual domestic appliances are fully displayed and form an attractive feature. The general atmosphere of the showroom is enlivened by an electric piano kindly lent by Messrs. Keith Prowse, Ltd.

At the inauguration ceremony Mr. Beauchamp was introduced by the Mayor of the Borough, Councillor E. J. Lansbury, J.P. Mr. BEAUCHAMP congratulated the undertaking on the position of "Electric House" and on its 25th anniversary of its commencement. He referred to the No. 2 station which was being built at Poplar, and said he looked forward to a further advance in that direction. He also alluded to the sympathy which the Electricity Commissioners showed towards the local development of electricity supply. He paid a tribute to the work done by Mr. J. H. Bowden, the general manager and chief engineer of the undertaking, and his staff. A vote of thanks to Mr. Beauchamp was proposed by Councillor W. Lyons, chairman of the Poplar Electricity Committee.

The Electrical Exhibition at Leicester.

The first "all electric" exhibition held at Leicester was opened in the Junior Training Halls on Thursday, October 8th, by the Mayor of the City (Councillor H. Simpson), and will be continued until Saturday, October 17th. Although the number of different firms which exhibited at the opening was satisfactory for an initial venture, the spacious halls were not well filled and the thirty-three participants could have had their number trebled without any overcrowding. There was a comprehensive display of electrical appliances, however, and some of the stands were of unusual interest. As might be expected, wireless goods were well to the fore, and were, indeed, the strongest feature of the display; and domestic appliances were also much in evidence. One of the largest stands was that of the Leicester Corporation Electricity Department, where were featured the entire range of domestic aids now offered by the undertaking to its consumers. It was an excellently arranged stand, calculated to do the maximum amount of educational work in the cause of domestic electricity. Another most interesting display was staged by Messrs. Gent & Co., of Faraday Works, Leicester. A conspicuous object of attraction was their "Pul-synetic" electric clock systems and time discipline apparatus, the clock, with its movement exposed, being studied with close attention by all visitors. The full range of the "Tangent" specialities of this firm were shown on a separate large stand. The Edison Swan Electric Company had an interesting show of domestic appliances as well as of accessories to meet office and factory needs. Messrs. F. J. Yates and Co., Leicester, specialised on electrical equipment for the manufacturer and merchant, and also had fitted up an all-electric bungalow which proved a centre of attraction and an eye-opener to the hundreds of ladies who inspected it. Messrs. Adcock & Shipley, machine tool manufacturers, Leicester, had an interesting display of electrical drilling machines, &c. An extensive range of electric fittings for all purposes was shown by Messrs. Brooks & Clayton, of Leicester. The Trent Electric Wireworks, Ltd., of Shardlow, Derby, staged a comprehensive outfit of wires and cables; and an exhibition of its storage batteries was given by the Ace Battery Company, Lutterworth.

Among the other firms which exhibited were the A.E.G. Machinery & Apparatus Company, recorders and other specialities; the Hendon Electric Lamp Co., Southampton Row, lamps and illuminated signs; G. W. Robinson, Great Windmill Street, London, lighting fittings, time switches and other devices; "Sadias" Ely Place, London, the "Zent" electric thermo-storage boiler; the Electric Heating and Hardware Co., of Birmingham; the General Electric Co., Ltd., domestic accessories; Belling & Co., Upper Edmonton, electric fires; Heatley and Co., Leadenhall Street, the Alcock electric defroster; the British Electric Transformer Co., London, electric cookers and fires. A notable feature of the exhibition was the activity of the Electrical Association for Women, which illustrated the progress made in lighting by electricity with working models of the various types and systems of electric lamps and installations, &c.; demonstrations were also given in how to avoid glare, and the correct utilisation of electricity in industry.

During the week a series of lectures on the use of electricity in the home was arranged by Miss Margaret Partridge, B.Sc., and the B.B.C. provided entertainment in the shape of concerts on the "wireless."

At the opening ceremony the Chairman of the Leicester Electricity Committee (Councillor A. H. Swain) presided, supported by the Mayor and the Mayoress (Mrs. Simpson); Mrs. A. H. Swain, Alderman G. Banton (Chairman of the Tramways Committee), Alderman H. Hand, Miss Clara Haslett (Director of the Electrical Association for Women), and a number of other ladies and gentlemen, including Mr. T. P. Bentley, the promoter of the Exhibition, were also present.

Councillor SWAIN briefly introduced the subject of exhibitions, and commended the project in Leicester, as he claimed that electrical development would go far to relieve the country of its industrial problems.

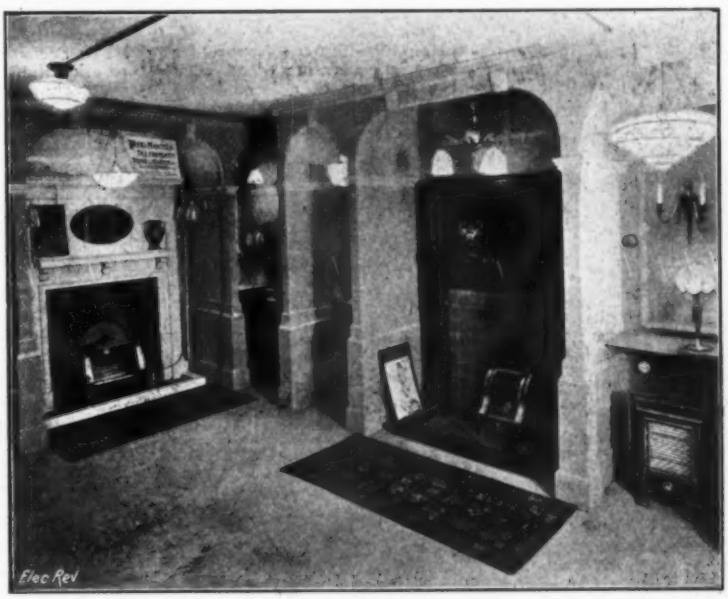


Fig. 7.—Demonstration Cubicles, Poplar.

The MAYOR, in declaring the exhibition open, said it was a vertising a not inconsiderable local industry, and that was a benefit to the city. The City Council was greatly interested in the exhibition, as it believed that electricity in the home would go far to ease the burden on the housewife and thus greatly promote health.

Miss HASLETT, in seconding a vote of thanks to the Mayor proposed by Councillor Acton, congratulated Leicester on its progress electrically, and said she had noticed that electrical appliances were placed within the reach of the poorest people, while she had the authority of the Home Office for stating that the city occupied a high place for the use of electricity in

factories. The immediate need was to educate women as to the advantages of electricity in the home.

Alderman Banton, who supported, expressed his belief that it was to the use of electricity they must look for the suppression of the smoke nuisance.

The Nottingham Electrical Exhibition.

Following quickly upon the opening of the city's new electricity generating station, an opportunity is being afforded at Nottingham of witnessing an electrical exhibition of great variety and interest, embodying appliances of the latest types for lighting, cooking, heating and power purposes. The display which was opened by the Mayor (Mr. J. Clarkson) on Thursday of last week, and, like the Leicester exhibition, is to be continued until to-morrow, has been arranged in the Drill Hall, Derby Road, an admirably adapted building, responsibility for the project devolving upon the local branch of the Electrical Contractors' Association, members of which have received the support of the Corporation Electrical Department. It is in view of a possible early reduction locally in the price of energy, that the exhibition derives additional interest as affording a ready means whereby prospective, as well as present, consumers of the Corporation may realise the value of adjuncts now available. The municipal electricity committee has afforded a generous measure of assistance to the venture, providing gratuitously all the energy needed and connecting up each stall free of cost. Besides its own exhibit, which is of considerable technical interest, it has undertaken the distribution of a great deal of instructive literature, bearing upon the subject of electricity supply for domestic and other purposes. It was a happy thought which led to the Corporation's participation in the display taking the form of a delicately furnished bungalow in which varied devices have been exemplified to the most skilful advantage, the municipal committee having contributed substantially to the success of the project generally by making itself responsible for an expenditure approximating £1,000. Among the largest of the exhibitors are Messrs. Henry Barker and Co., of Angel Row, Nottingham, who make a most varied display, beside having been responsible for most of the attractive decorative work in connection with the Corporation bungalow. The Edison Swan Electric Company has, through its local branch, provided a stand replete with interest, among the labour-saving appliances there brought under notice being the "All British Little Glutton" suction cleaner, presenting many valuable features. Ediswan fires are also being shown, together with alabaster bowls and electric vases, the whole presenting a very artistic effect.

Among the principal exhibitors is a well-known local firm, Messrs. Pearson Bros., of Long Row, who make an extensive display of domestic apparatus, including, prominently, products of the Western Electric Company. Among these are washing and ironing machines, in which the facilities for effective work are strikingly demonstrated. Amplifying their show of wireless apparatus, Messrs. Attenborough & Turpin, of Goldsmith Street, Nottingham, have afforded the opportunity for the inspection of a Wolseley electric generating plant, of a size commensurate with the requirements of a large house which may not be able to obtain a public supply of electricity. Their stand also, which is typical of several others, includes a great variety of labour-saving domestic appliances. Articles for the manufacture of which the General Electric Co., Ltd., is responsible are to be found upon most of the stalls. One of the most interesting stands in the exhibition is that of Messrs. J. & S. Farr, Ltd., a well-known Nottingham firm, who show a wide range of electrical appliances. Messrs. Thomas Danks and Co., of Nottingham, have also contributed substantially to the success of the exhibition, one of their specialities being electrical apparatus for water heating. The British Thomson-Houston Co. also make a comprehensive contribution. The wireless side of the exhibition is of great variety and interest, a notable feature being the cheapness of many of the sets. Keen interest has been manifested in relation to the display which has attracted large numbers of visitors, including many from surrounding districts, and has admirably fulfilled the municipal purpose of exemplifying the value of electricity for all its varied purposes. Incidentally, following upon the opening of the new power station, it has served also to stimulate considerably the demand for electrical energy, it being altogether encouraging from the municipal point of view to know that the department has been lately inundated with applications from those who are desirous of obtaining supplies.

Of particular interest on the opening day were successful tests made by Mr. L. H. Pearson, a local inventor, whereby electric current was controlled by speech. Mr. Pearson claims to have perfected a device which makes it possible to command electric light to switch on and off by word of mouth. Briefly, the device transforms sound waves in such a manner that they will control any electrical circuit. He startled the onlookers by starting up a motor merely by the sound of his voice. Mr. Pearson hopes to adapt the invention to surgery, so that patients' heart-beats could be recorded at some distance away.

The Scottish Lighting Service Bureau.

The Scottish Electric Lighting Service Bureau at 20, Trongate, Glasgow, an offshoot of a similar bureau in London, and the first of its kind in Scotland, was formally declared open on Monday by the Lord Provost in the presence of a large gathering of those interested in electric lighting. The bureau, which is conducted by Mr. Henry E. Hughes, district engineer, has as its prime object the educating of the public in the modern principles of electric lighting, and a commodious demonstration room, in which numerous electric fittings are installed, will be used to show the correct and incorrect methods of lighting in the home, shop, and factory, and also on the street. The elimination of "glare" is one of the principal features of the demonstrations. Particularly interesting is the display of shop window lighting, showing the attractive powers of spot and flood lights, while there are also displays of illuminated sign and poster lighting. In a central lecture room contrasts will be shown in shop interior and street lighting, while house lighting methods are demonstrated in an apartment fitted up as a sitting room. Lectures open to the public will be given each day by Mr. Hughes as well as by experts from London. Many Scottish electrical bodies, including the Glasgow Corporation lighting and electricity departments, are interested in the work of the Bureau, which has been established purely for educational purposes.

New Electrical Devices, Fittings and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

An Automatic Motor Acceleration Device.

The Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester, has produced an automatic accelerating device for use with liquid controllers applied to motors driving

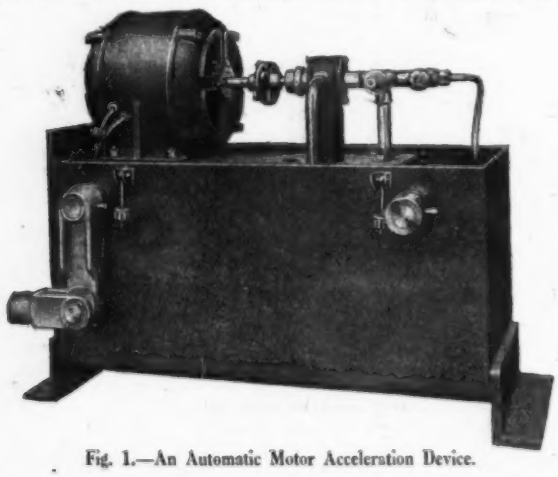


Fig. 1.—An Automatic Motor Acceleration Device.

electric winders, haulages, and the like. By means of this apparatus the maximum safe rate of acceleration can be obtained automatically, thus securing maximum economy. The device prevents too-rapid acceleration and ensures that when the operating lever is pushed from zero to the full-speed position, the motor attains full speed in the time for which the apparatus is set. But whilst preventing too rapid acceleration, and giving automatic attainment of the correct economic speed, full power is retained to run at any lower speed that may be desired, or to obtain inching for decking purposes.

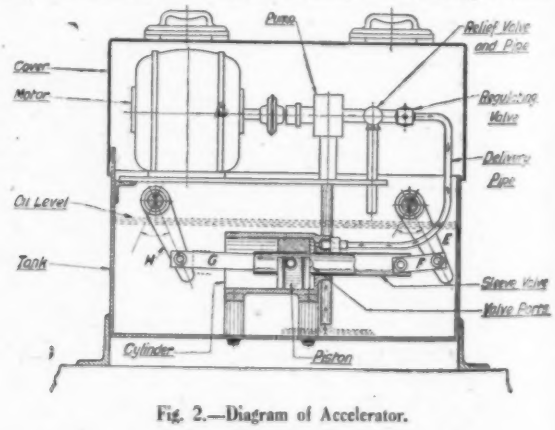


Fig. 2.—Diagram of Accelerator.

Should a different time setting be required, the process of effecting this is a very simple one. Moreover, an easy adjustment is provided whereby the automatic action may be dis-

connected and full manual control restored should this ever be necessary. The device is illustrated in fig. 1, while fig. 2 is a diagram showing the method of operation. Referring to fig. 2, the principal parts are a steel tube forming a simple sleeve valve connected with the operating lever through links E and F; a piston connected with the controller through links G and H and an external link; and a motor driving a pump which circulates oil (at uniform pressure to ensure uniform acceleration) through a delivery pipe fitted with relief and regulating valves. When in the position shown, oil drawn from the bottom of the tank and pumped into the cylinder, escapes through four port holes in the sleeve valve. Directly the sleeve valve is moved into the full speed or any intermediate position, the piston is forced by oil-pressure to follow the valve until the port holes are again sufficiently uncovered to allow the oil to escape. The rate at which the piston moves forward, and consequently the time taken for automatic operation of the controller is determined by adjustment of the regulating valve. In deceleration, the sleeve valve is moved back in unison with the operating lever, and the immediate return of the piston is arranged for by having the moving parts of the controller biased by means of weights so that there is a force tending always to push the piston to the back of the cylinder. To avoid any possibility of jarring, spring buffers are fitted. When installing the apparatus, the regulating valve must be set so that the controller is moved from its off to its full on position in the number of seconds given on the performance diagram, after which no further adjustment is required.

An Electric Organ-blowing Equipment.

The accompanying illustration is of a new type of single stage electric organ-blowing equipment that has recently been developed by the ROCKINGHAM ENGINEERING CO., Beulah Road, Thornton Heath, Surrey, specially designed to meet the requirements of instruments having low and medium pressures, and where an effective and inexpensive type of blowing apparatus is desired. The blower is built up with cast-iron diaphragms and sheet steel castings. The fan or impeller is mounted on the electric-motor shaft and the blower and motor are arranged on a combined steel bedplate as shown, making a solid engineering job of compact construction. The impeller is designed to secure the highest efficiency in operation and is proportioned according to the output of volume and wind required. Three forms of construction can

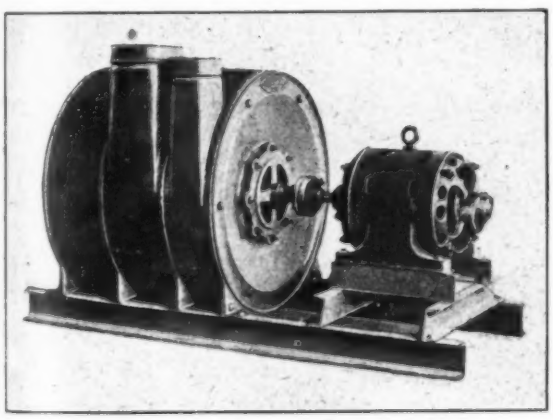


Fig. 3.—Electrical Organ-Blowing Equipment.

be employed according to requirements, one with an open intake on the motor side; one with an internal intake chamber and a non-return valve; and one with a piped intake so that the air may be drawn from another source, this being specially desirable where the apparatus is placed in a heating chamber and avoiding the use of hot air laden with dust and sulphurous fumes. From the outlet of the blower (which can be arranged vertically or horizontally), the wind trunk is run to the main organ reservoir, where the control valve is fixed, automatically regulating the supply of wind according to the demands of the player. The electric motor runs at normal speed while in use (the apparatus being controlled on the wind side only), but owing to the particular construction of the blower portion, the load on the motor varies with the wind output actually taken. For large organ blowing installations and instruments in which higher wind pressures are employed, the muti-stage type of blower is adopted (fig. 3) from which wind at varying pressures may be taken by separate wind trunks. For still higher pressures an independent booster is used to deal with a portion of the wind required, this booster being belt driven or direct coupled to the main motor and blower.

It is interesting to note that the magnificent organ at the Liverpool Town Hall, originally blown by two steam engines, has been equipped with an electric blowing installation by the Rockingham Engineering Co. This plant consists of a 15-h.p. three-phase motor, running at 1,440 r.p.m. direct coupled to the main blower, which has a capacity of 3,500 cubic ft. of air per min. This blowing plant is placed in the basement of the building and controlled by a push button at the organ keyboard working in conjunction with an automatic contactor panel in the blowing chamber.

Smoke Abatement.

A Conference at Buxton.

THE annual conference of the Smoke Abatement League of Great Britain was held this year at the Palace Hotel, Buxton, from October 2nd to October 5th. It will be recollected that in November, 1924, a lengthy conference combined with an exhibition was held in Manchester. Since that time many lessons have been learnt, chief amongst which is the fact that the reading of lengthy papers, however admirably prepared, is not conducive to action in the great problem of educating public opinion. Again, by holding the conference in the form of a "Smoke Week-end" in a quiet place, it was thought that further headway would be made. It would appear certain even at this early date that the action of the Executive has been more than justified, and the Buxton Conference will no doubt be regarded as the most successful in the history of the League. In the words of Dr. R. Veitch Clark, the Medical Officer of Health for the City of Manchester, "it is evident that the movement is being reborn."

The League is extremely grateful to those members of the electrical profession who from time to time have rendered to it valuable assistance, but it was unfortunate that amongst those assembled at Buxton there were very few representatives of the industry. To the most casual observer it must have been apparent how useful the presence of a few electrical experts and commercial heads would have been. It is to be hoped that in future years the industry will take an even larger part than it has done in the past, as, after all, the final solution of the problems will rest to a very large extent with it.

After the hotel dinner on the Friday night an informal meeting was held under the chairmanship of Dr. F. Ashworth (Medical Officer of Health for Rochdale), who has done much towards the solution of the problem of smoke abatement under the exceptionally difficult conditions obtaining in his town. At this meeting the hon. secretary (Mr. C. Elliott) gave an account of the main objectives of the League. He explained that the main line of all its actions must be the education of public opinion, and as a central point in this the League advocated the setting-up of independent advisory bureaux and showrooms for the dissemination of the knowledge of the principles of heating and ventilating.

The annual meeting of the League was somewhat protracted and many important details were discussed. Two of the points, however, require emphasis; one was the desire of the Executive to remove any feeling that the League was a "Manchester" affair, and the second was the question of the establishment of branches. During the course of the meeting it transpired that another conference was likely to be held in Glasgow early in 1926, and, as is now well-known, the Bingley Hall at Birmingham has been reserved for an exhibition in September, 1926. The election of the General Council was a matter over which great care was taken, the meeting being adjourned to give further time for discussion. Amongst those re-elected was Ald. W. Walker, of Manchester. A number of gentlemen who were unable to devote the necessary time were replaced, and an active and strong council is now in readiness to deal with the important constructive programme unanimously endorsed by the conference.

The chair was taken by Coun. J. H. Robson, of Huddersfield, and short papers were read by Mr. R. H. Clayton, B.Sc., and Miss M. Fitzgerald, A.R.S.I. The meeting was devoted to the study of the best methods of educating public opinion. Coun. Robson, after a brief reference to the absence of smoke during the coal strike of 1921 and also at such Continental towns as Barmen, Elberfeld, &c., emphasised the importance of teaching the public actual facts, not merely through the ear but through the eye as well.

Mr. R. H. CLAYTON commenced with a vigorous denial of the accusations made against the owners of power plants for making black smoke. Not more than 5 per cent. of the industrial chimneys of Manchester emitted serious quantities of smoke, he proceeded, and other towns should follow suit. It was the domestic fire which formed the greatest difficulty. In spite of the efforts of the gas and electricity departments of the various Corporations a glance on each side of the railway passing along from Stockport into London Road (Manchester) would satisfy anyone as to where the trouble laid. Too little attention was paid to the cost of smoke, estimated so far as Manchester was concerned at about £1 per head of the population. This point should be continually pressed on the public. It was not appreciated so much by the rich, said Mr. Clayton, as by the poor. The rich man got away from the smoke as soon as his work was done, but he forgot to calculate the cost not only of time and money spent in travelling, but also the serious situation which arose by the alienation of the master from his employés. This was a point worthy of consideration even apart from the effect of smoke upon the health of the worker and consequently upon his output. Public bodies relied on the gas and electricity departments or on the medical officer of health. This was not the right way. The question of air pollution should be dealt with on the same lines as those on which the purification of rivers had been attended to. In the latter case, the public had no objection to money being spent with only a distant hope of a monetary return. Air purification, on the other hand, had the certainty of an immediate profitable return. He advocated the setting up of independent fuel heating and ventilating departments. Ventilation was most important and could not be divorced from heating. "Smoke areas" should be arranged on the lines of those "regions"

already set up around the large towns, and a sum of £10,000 per annum allotted to each heating and ventilating department. On the ten million people around Manchester this would involve a very small rate. The department would be under the Sanitary Committee without bias from the gas or electricity departments. Practical study, work and experiments (with the co-operation of ladies) would be carried on. In a word, "Public Education." All reforms, said Mr. Clayton, came from the people, and to attain them, practical demonstration, not lectures, was required.

Miss Marion Fitzgerald then put forward her views on the best methods of educating public opinion, and in a short practical address she pointed out that first of all the object must be to convince the housewife that the evils need not be tolerated, and then to show her how they could be avoided. The chief arguments to use were health, civic benefit, and, above all, the now popular labour-saving devices. The League should associate itself with all civic and social societies working for the betterment of the conditions of the people. The Association was grateful to the Press for its assistance in the past. The domestic science teacher should be approached through the Boards of Education. What the people required was real information, not counsels of perfection. She would give her full support to the independent department alluded to by Mr. Clayton and urged the League to do so.

Mr. H. G. Clinch, the chief inspector of the Halifax Health Department, in the course of a short speech after the discussion had commenced, alluded to the fact that in his town they were well backed up by the gas and electricity departments.

Mr. J. Munro, of the Health Department, Glasgow, gave some details of the excellent work carried on in that city, and said that the Air Purification Committee was "sub" to the Health Committee.

Dr. Barlow (Medical Officer, Wallasey) alluded to the fact that local authorities had now legal powers to spend money on propaganda work in this connection.

Mr. S. H. Moore, Chief Sanitary Inspector of Chester, held that the new department should not be separate but should be under the control of the medical officer of health.

Dr. R. Veitch Clark (Medical Officer, Manchester) said that the medical officer who thought he could deal with the smoke question without outside aid was a fool. He required the full weight of public opinion. The Smoke Abatement League should be put into such a financial position as would enable it to send lecturers all over the country. It was not a problem of single authorities but of large "Smoke Areas."

(To be concluded.)

The Electrical Import and Export Trade of Austria.

Progress of Exports.

The following table gives particulars of Austria's imports and exports of electrical machinery and apparatus in 1923 and 1924, the total values in gold crowns being stated, together with the total weights in quintals and the weights by countries of origin and destination. The steady progress which has been made in almost every branch of Austria's export trade in electrical goods, which is carried on chiefly with neighbouring countries, is clear testimony to the recovery that has taken place in Central Europe.

	Imports, 1923.	Imports, 1924.	Exports, 1923.	Exports, 1924.
Dynamos and motors.—				
Value in 1,000 gold crowns	1,572	2,448	7,837	7,875
Number	11,546	12,980	7,217	8,617
Weight in quintals	3,581	5,612	20,821	18,536
Belgium	—	—	612	507
Bulgaria	—	—	1,311	1,218
Germany	2,462	2,661	2,056	625
Italy	44	64	1,587	857
Poland	—	19	3,498	2,633
Rumania	—	—	2,658	3,303
Jugo-Slavia	73	1	3,711	2,989
Czecho-Slovakia	186	1,027	1,920	2,950
Hungary	702	1,627	1,474	1,976
Parts of ditto.—				
Value in 1,000 gold crowns	1,657	1,649	942	1,205
Weight in quintals	4,249	3,808	2,568	2,763
Germany	2,110	768	20	211
Switzerland	198	68	49	—
Czecho-Slovakia	1,926	2,964	776	859
Dynamos and motors joined to mechanical plant.—				
Value in 1,000 gold crowns	90	258	210	600
Number	910	1,819	1,434	3,778
Weight in quintals	227	380	576	984
Germany	212	351	176	113
Great Britain	—	1	30	164
Rumania	—	—	50	77
Jugo-Slavia	—	—	145	222
Czecho-Slovakia	1	2	67	66
Brazil	—	—	—	49
Parts of ditto.—				
Value in 1,000 gold crowns	4	90	3	1
Weight in quintals	11	121	8	1
Rotary transformers.—				
Value in 1,000 gold crowns	—	—	28	—
Number	—	—	3	—
Weight in quintals	—	—	81	—
Stationary transformers.—				
Value in 1,000 gold crowns	311	401	2,374	1,657
Number	2,337	1,991	4,843	7,133
Weight in quintals	1,074	1,403	7,529	4,864
Germany	976	1,098	31	46
Italy	—	—	255	554
Poland	—	—	1,310	1,035
Rumania	—	—	1,154	338
Jugo-Slavia	1	7	1,486	1,144
Parts of ditto.—				
Value in 1,000 gold crowns	15	67	110	31
Weight in quintals	46	192	393	98
Telegraph and signalling apparatus.—				
Value in 1,000 gold crowns	182	257	101	357
Weight in quintals	165	110	134	105
Germany	132	106	11	3
Great Britain	32	1	—	9
Jugo-Slavia	—	—	23	15
Czecho-Slovakia	—	—	50	15
Telephones and microphones.—				
Value in 1,000 gold crowns	281	747	2,163	4,521
Weight in quintals	221	467	2,697	2,833
Germany	210	382	529	84
Great Britain	2	17	458	446
Italy	—	15	300	262
Poland	—	—	223	170
Rumania	—	—	228	229
Jugo-Slavia	—	2	172	164
Czecho-Slovakia	1	1	538	1,176
Railway safety and signalling apparatus.—				
Value in 1,000 gold crowns	18	21	395	601
Weight in quintals	16	14	353	455
Poland	—	—	144	106
Rumania	—	—	1	18
Czecho-Slovakia	—	—	208	331
Electricity meters and measuring apparatus.—				
Value in 1,000 gold crowns	1,460	1,073	1,483	2,337
Weight in quintals	1,622	1,690	2,048	2,724
Bulgaria	—	—	179	144
Germany	1,505	1,436	212	16
Italy	—	—	161	343
Portugal	—	—	257	384
Switzerland	51	199	4	3
Czecho-Slovakia	4	1	339	231
Hungary	51	47	38	87
Incandescent lamps.—				
Value in 1,000 gold crowns	2,230	3,749	14,563	10,660
Weight in quintals	1,448	2,343	24,724	18,137
German ports	—	—	4,177	5,048
Germany	1,133	1,784	7,305	3,190
Great Britain	1	2	3,191	2,372
Italy	3	—	1,912	1,695
Poland	—	—	1,372	178
Trieste	—	—	766	655
Hungary	277	528	61	106
United States	—	—	1,396	953
Heating and cooking apparatus and electric irons.—				
Value in 1,000 gold crowns	39	70	166	229
Weight in quintals	110	176	638	716
Germany	82	147	7	82
Italy	5	11	79	95
Switzerland	22	6	3	11
Jugo-Slavia	—	—	154	165
Hungary	—	—	90	107
Other electrical apparatus.—				
Value in 1,000 gold crowns	3,382	5,220	4,342	6,602
Weight in quintals	6,763	7,909	11,764	11,385
Germany	6,367	7,080	209	257
Italy	10	46	331	221
Poland	1	1	1,601	2,092
Rumania	—	—	1,286	1,144
Switzerland	65	129	45	62
Jugo-Slavia	—	—	2,493	2,592
Czecho-Slovakia	248	430	3,531	2,951
Hungary	55	160	740	715
Insulating tubes.—*				
Value in 1,000 gold crowns	4	205	204	1,196
Weight in quintals	22	310	1,178	1,701
Cables and insulated wire.†—				
Value in 1,000 gold crowns	53	203	2,753	6,107
Weight in quintals	212	534	12,454	16,174
Germany	118	214	103	349
Great Britain	2	—	261	1,143
Italy	83	261	358	226

* Exported in 1924 to neighbouring countries and Egypt.

† Exported in 1924 to neighbouring countries, Egypt, Cuba, and Uruguay.

	Imports, 1923.	Imports, 1924.	Exports, 1923.	Exports, 1924.
Accumulators and plates.—				
Value in 1,000 gold crowns	28	32	183	445
Weight in quintals ...	199	119	1,455	2,042
Germany	195	83	19	32
Jugo-Slavia	—	—	639	1,446
Czecho-Slovakia ...	—	15	506	217
Hungary	4	20	113	87
Carbons for lighting.—				
Value in 1,000 gold crowns	17	13	124	60
Weight in quintals ...	105	63	934	427
Great Britain	—	—	527	197
Canada	—	—	—	110
Electrodes.—				
Value in 1,000 gold crowns	540	340	75	253
Weight in quintals ...	25,651	11,307	1,257	3,160
Germany	18,989	5,802	57	929
Jugo-Slavia	6,234	5,174	23	71
Other electric carbons.—				
Value in 1,000 gold crowns	102	119	44	76
Weight in quintals ...	170	198	125	216

The Consumption of Electricity in Relation to Population.

By J. W. BURR.

(*Abstract of Chairman's Address: Western Centre of the* INSTITUTION OF ELECTRICAL ENGINEERS.)

We are told that in 1922-1923 some eighty per cent. of the undertakings in Great Britain had not reached a stage of development corresponding to a sale of one hundred kWh per annum per head of the population and that sales of three hundred kWh, or over, per annum per head of population had been attained in a few cases only. The Electricity Commissioners also state in a review of their return of statistics of electricity undertakings, that on the basis of the Census of 1921, the aggregate population of the areas of supply of the local authority undertakings included in the return was approximately 22.8 millions, thus denoting an average sale in 1922-1923 of about 98 kWh per head of the population in such areas. The corresponding average figure for the supply companies' areas is not given, but we may assume that it does not differ from the above figure to any appreciable extent. Compare these figures with those given by Continental engineers, at the World's Power Conference. In Norway the estimated annual consumption per head of population was 2,000 kWh. I am quite aware that these figures apply to hydro-electric stations; all the same I see no reason why the difference should be so great. It would appear that we have barely touched the fringe of the domestic load in this country and it is certainly up to we engineers to find out the reason.

Do we realise that domestic consumers can easily become the greatest and most important of all users? We must be prepared to give the consumers what they want and not what we think they ought to have; educational publicity is in my opinion necessary, together with enthusiasm. We must be enthusiastic and after all we have reason to be; we must, of course, temper our enthusiasm by scientific knowledge.

"Is electricity available to all who require it?" The answer is decidedly in the negative. Many people could not at present have a supply of electricity, whatever their wishes might be, simply because the cost of running mains or transmission lines is so high. If a supply is to be available in the rural districts the Government should be asked to increase the grant or the cost of the work must be reduced in some way or other. This can only be done by co-operation with the cable, transformer and switch manufacturers, and I believe that great reduction in prices can be made if they will only take the matter in hand. Further, I would point out to manufacturers that this is a problem for them to solve and not for the supply authorities, as the cost of generation does not enter into the matter to any great extent. In regard to legislation, I am decidedly of the opinion that the Electricity Supply Acts restrict real expansion and attempts should be made to remove many of the restrictions which not only hamper the industry, but are in my view unnecessary.

Have we a suitable tariff for domestic apparatus and, if not, is it possible to obtain one? Tariffs vary in different parts of the country but, generally speaking, they can be grouped under two heads; the "flat rate" system, and the "two part" system of charging. It would appear that no tariff obtains to-day in this country such as to induce the domestic consumers to use electricity for all purposes, and it may, of course, be partly due to the cost of the apparatus.

Our generating costs are made up of the two factors: Annual charges on capital expended; and running costs. It necessarily follows that this fact will increase the total cost of generation. I suggest that as soon as a new station could show a saving on the cost of supply to the consumer equal to the annual capital charges on the old station, the latter should be shut down forthwith, as by that time it has outlived its usefulness. I do not think that any interest, municipal or company, should be allowed to stand in the way of this being done. In my view the Electricity Commissioners should have compulsory power in this respect, and their decision should be absolutely final.

When I referred to the erection of new stations I was not talking of super-stations but of medium-sized generating stations with modern plant situated about 20 or 30 miles apart, the exact distance depending upon the electrical density of the area. These stations should be suitably interconnected, provided the generating stations are not too far apart, as not only would the expenditure on generating plant be reduced thereby, but it would also improve the load factor and reduce operating costs. It would further secure continuity of supply to a great extent.

In regard to the much talked of super power station and its possibilities of reducing generating costs, I have always held the view that while the thermal efficiency of a medium-sized station, *i.e.*, one with a plant capacity between 25,000 and 50,000 kW, might be less than the thermal efficiency of a modern super power station equipped with all the heat saving appliances, it may easily be that the actual cost per kWh sold will be actually higher with the more efficient plant. It may also be that the larger station has to distribute electricity over a wider area and as a result will have to bear higher capital charges for main and transmission lines and also higher C^2R losses. It is possible for these conditions to neutralise the difference in the thermal efficiency between the two stations. I am assuming that the super power station is striving for the highest thermal efficiency and that its plant would probably consist of boilers suitable for a working pressure of between 350 and 500 lb. per sq. in. and a total steam temperature between 700 and 750 deg. F.; of air heaters instead of water economiser; of water heaters for raising the temperature of the condensate on its way to the boilers, fed with exhaust steam and steam bled from the turbine at various stages. The turbine units would be as large in capacity as possible and run at the highest speed to conserve space. With all the heat-saving apparatus and best modern plant obtainable, it is not possible for any super station to obtain an operating thermal efficiency of more than 25 per cent.

Briefly, then, I consider a medium sized station, well equipped with modern plant of the ordinary type, well situated in regard to the electrical centre of gravity and the supplies of coal and water, can supply consumers as cheaply as any super station distributing over wide areas. I would also say that in my opinion, the storage of large quantities of coal, the removal of ashes and the provision of a plentiful supply of cooling water, are problems it is often difficult to solve. In regard to generating stations generally, it is interesting to note that the maximum thermal efficiency of the most modern station erected was slightly under twenty per cent.

As much attention should be paid to the possibility of reducing distribution costs as to that of reducing generating costs. Cannot some method be devised for putting cable underground without disturbing the surface of the roadway? Thrust boring has been tried with a small measure of success. The present boring plant, however, is not suitable for all subsoils and reliable information in regard to the nature of the sub-soil and obstructions is not always obtainable. The idea, however, is good and needs developing. Co-operation is required between the Post Office, Electrical, Water and Gas Departments, so that in the event of one department opening up, the others could take advantage of the excavation, if required. When a roadway is made up or relaid it will probably pay to lay ducts on both sides of it, even although the prospective demand in the district does not justify the laying of a main at that particular time.

Every effort should be made to reduce the annual capital charges on the distribution system, not by "skimping" the copper (this may be false economy), but by reducing the cost of laying as much as possible. The running costs should also be reduced to a minimum.

I do not think it is generally realised what difference it makes in the works costs if the staff and men all work together instead of against each other. While I have no wish to "scratch the back" of the workmen, I would say that if more time was spent in trying to get the employés interested in their work and pulling together, than in reducing wages, I think it would be better for the undertaking generally.

Having produced our energy at the lowest possible cost, we must see that it is sold at a price which will give a reasonable return on the capital expenditure involved. In my view any profit should be returned to the consumer in the form of a reduction in the price of electricity, and a loss would have to be met by an increase in the price.

The tariff which obtains mostly on the Continent is, I believe, one in which the charge is the same irrespective of the use to which the energy is put. It is so much per kW year. If, therefore, a consumer pays for 1 kW year he may consume 8,760 kWh for any purpose he likes. The simplicity of the charge would appeal to the consumer, and the exit of the integrating meter would appeal to the engineer.

In order to completely solve our problem we must deal with the wiring and equipping for all domestic purposes.

I estimate that at present the cost of suitably wiring and fully equipping a villa residence of any seven rooms for all purposes, at £115. I believe that by mass production this price could be reduced enormously. If the undertakers are prepared to take a risk by offering a suitable low "all-in" tariff to all consumers proposing to use electricity for all purposes, I think the manufacturers should also be prepared to take a risk in the way of producing electrical apparatus in mass at a low price and chance the market.

New Electric Fires.

Designs for the Coming Season.

(*Concluded from page 594.*)

F. Turner & Co.

The employment of an electric fire in the place of a coal fire often means the leaving of an ugly gap which the fire is unable to fill. A number of firms which manufacture fires also produce a means of closing up this space. An example of this work is illustrated in fig. 27. This is an art metal surround of handsome though plain appearance made by Mr. F. Turner, Birmingham. It is adjustable and can be fitted in fireplaces measuring from 24 to 42 in. in width. It is made in brass or copper, or with an oxidised silver finish.

Inventum Electrical Appliances.

The principle feature of the fires of this make is the "plug in" elements. This arrangement renders the replacement of elements as simple a matter as the changing of an electric lamp. It is claimed that the elements are scientifically focused along the focal line of the parabolic reflectors. A very cheery appearance is given by these fires when in use. Fig. 30 is a wall design of fire which is supplied in either black, satin brass or florentine bronze. It is fitted with brass reflectors and the elements are designed for either 500 or 750 W loading.

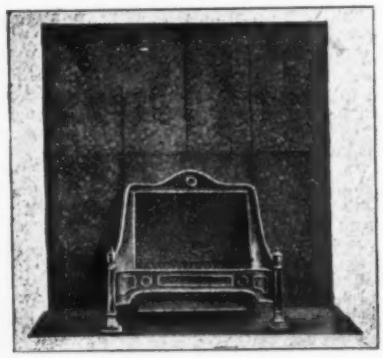


Fig. 27.—An Art Metal Fire Surround.

Fig. 28.—Reflecting Well Fire.

Fig. 29.—Bowl Reflector Fire.

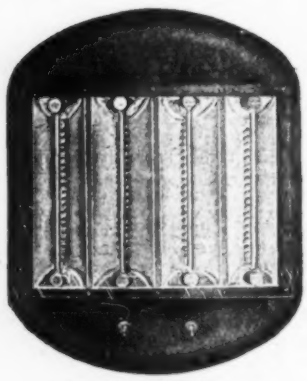


Fig. 30.—Wall Fire.

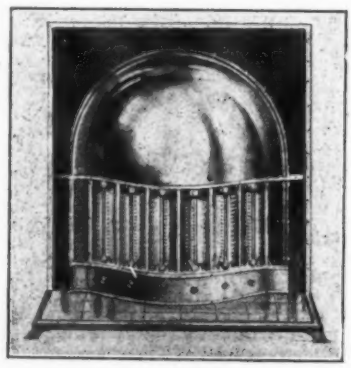


Fig. 31.—Fire with Tiled Hearth.

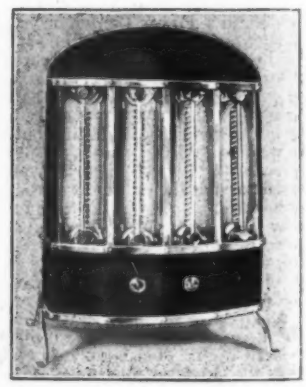


Fig. 32.—Sheet Metal Fire.

Fig. 31 is a new design depicting the hand made fire with a screen covering the aperture above the elements as provided in an ordinary coal fireplace. The screens are made to measure. These fires are supplied with detachable tiled hearths of any colour for decoration purposes. The elements are supplied in standard sizes for 500 W and 750 W loading.

Fig. 32 is of a particularly effective design finished in crystallised black with nickel relief. Each plug-in element is provided with a separate parabolic nickel reflector. As in the other designs the elements are made in two sizes for 500- and 750-W loading.

Wm. Geipel & Co.

The "Quead Junior," model Q 20, fig. 29, and the "Queen," model Q 21, fig. 28, are two attractive designs which this company has placed on the market. In the former the bowl reflector, which is of the usual design, is hinged to the pedestal so that it will tilt and lock firmly at any angle. The reflector is made of stout solid copper of excellent finish and the pedestal is of cast iron with a black enamel finish. The element is readily adjusted, and is made in three standards, for pressures of 100/120 V, 220/220 V, and 240/250 V. Its loading is 600 W. A strong and neat guard of copper finish is designed to accommodate a kettle when the bowl is tilted to a horizontal position. The latter is an attractive design of reflecting well fire. The reflector is of the usual copper finish, and is fitted with cast aluminium sides of artistic design. The element is of the usual "Quead" patented type. The consumption is 1,000 W ordinarily, or 2,000 W with a snap switch. It is made in standard sizes for pressures up to 250 V. A heavy coppered finish guard is provided.

A New Electrical Process for the Manufacture of Steel.

By HENNING FLODIN.

(*Abstract of a Paper read before the* IRON AND STEEL INSTITUTE.)

THE paper deals with a series of experiments in the direct smelting of ore by electrical means, carried out by the Electro-Chemical Section of the Royal Technical High School at Stockholm during the years 1923-25. The object of the trials was to ascertain whether malleable iron and steel could be extracted direct and continuously from iron ore, and at the same time to reduce the percentage of phosphorus and sulphur content in the ore and coal. An electric furnace was specially constructed for the purpose, working with a load of about 30 kW. A few trials alone sufficed to establish that iron with 0.02 per cent. carbon and upwards could be produced without difficulty. Sixty-five such trial reductions were made in a furnace of the particular construction mentioned, the results of which fully bore out that the method pursued was on the right lines.

The effects were so encouraging that it was decided to test the process thoroughly on a reasonably large industrial scale at the ironworks at Hagfors, Sweden. An electric furnace with a load of 250 to 300 kW was used, and up to the time of writing 114 tappings had been made. It was found that there was no difficulty whatever in producing iron and steel of any desired carbon percentage at successive tappings without interruption of the process, showing that the process could be controlled in the same manner and quite as easily as the discontinuous open-hearth process. The manganese and silicon contents are controlled in the same manner as in the open-hearth process. From the heat No. 3, containing 0.78 per cent. carbon, an ingot was taken and rolled out at the Forsbacka Ironworks, Sweden, and the material was used for making chisels for pneumatic hammers, drills, and miners' sledges, mainly for the purpose of testing the material. The chisels have proved to be fully equal to those made of the firm's own Bessemer steel, and a drill penetrated 0.4 metre into granite in a wet borehole without regrinding. The total radiation surface of the experimental furnace was 30 square meters, and when running empty the consumption was about 100 kW. At a load of 300 kW the furnace was therefore working with 200 effective kW.

A 3,000-kW furnace would have a radiation surface 2.33 times larger than the experimental furnace, or 70 square metres, so that the heat loss in this case would be 2.33×100=233 kW. The effective load would therefore be 3,000−233=2,767 kW. The losses due to water-cooling in the moulds, in contact rings and refrigeration, &c., would amount to 233 kW, making the total loss 500 kW.

The loss on energy at a load of 300 kW in the experimental furnace was 33.3 per cent., and in the 3,000-kW furnace it would be 16.65 per cent. At a load of 300 kW 1 ton of iron was produced in the experimental furnace, with an expenditure of 2,700 kWh; deducting 100 kWh for empty running, the production thus amounted to 111 kilogrammes per hour. If the 3,000-kW furnace worked with a net amount of 2,500 kW (3,000 less 500 kW loss), the production would therefore be:—

2,500 kWh×111 kg. per hour/200 kWh=1,388 kg. per hour.

The gross expenditure of energy in the furnace would thus be:—

3,000/1.388=2,162 kWh per ton of iron.

The heat content of the waste gases would amount to between 2,700 and 2,900 calories.

The process works direct on a mixture of ore and coal in a single furnace, and the product is in the form of malleab'e iron and steel capable of being teemed into chills or other moulds in the usual manner. The process, however, does not only work direct as "one single process," but is continuous, interruptions occurring only at the moments of tapping, when the continuous feeding in of the mixture of ore and coal ceases, to recommence immediately after the tapping is complete. The operations must, of course, be carried out in such a manner that the furnace is fed with the mixture of coal and ore in quantities corresponding to the capacity of the amount of electrical energy supplied for reduction and fusion.

The reduction of the iron proceeds uninterruptedly and continuously. The metallic iron particles reduced from the ore may be compared to a fine rain continually dropping through the slag bath to the bottom of the furnace, where the molten malleable iron constantly accumulates. Practically speaking, the iron is in a fit condition at any moment for tapping in varying quantities in proportion to the rate of reduction, and it is hardly to be imagined that a higher degree of continuity can be reached in any process for the production of iron.

The raw materials used at Hagfors in the experimental furnace were Swedish hæmatite ore, and both English pit coal and Swedish charcoal. No refinement in special furnaces is necessary for the removal of phosphorus and sulphur to a sufficiently low point, the process being based on the principle that in the reaction the molecules are in contact, thus facilitating the transfer of the phosphorus and sulphur to the slag. A specially low-carbon material produced by the "one single process" may perhaps meet certain requirements for electric and magnetic purposes, and the product is generally suitable for any purpose where an extremely low percentage of carbon in the iron is desired. After the thorough tests to which both the iron and steel materials produced at Hagfors have been subjected, the author is satisfied that their quality is superior both to the open-hearth and the Bessemer products. While it is true that no scientific investigations have been made into the causes which make such results possible, we are justified in assuming that the superiority of the product of this electrical process is due to the relative absence of gases and the small amount of slag. The process works constantly under exclusion of air, and with a slight over-pressure in the furnace. Attention is specially directed to the low percentage of carbon (0.02), and it may confidently be expected that cheap stainless iron and steel produced by the "one single process" will soon appear on the market.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Metal Finishes.

I wonder if you can explain what is meant by the term "real B.M.A.," in relation to metal-work finishes, and why this particular finish should be so costly.

My knowledge on this question is extremely limited, but I was always under the impression that silver finishes were the most expensive. Is "real B.M.A." finish applied to ordinary brass-work, or must it be used only in conjunction with a special metal? Is it a "finish" or is it a special metal alloy?

Contractor.

October 9th, 1925.

Broadcasting Power.

I was very pleased to see in the current issue of the ELECTRICAL REVIEW Mr. H. P. Amphlett's comments on the above subject. Since Professor Low's article some discussions by misled wireless enthusiasts of my acquaintance have sounded like the tales of the "Arabian Nights."

In view of the poor transmission efficiency compared with present-day methods I think Prof. Low is looking "well ahead."

R. C. G. Knight.

West Hartlepool, *October 10th*, 1925.

Is the Contracting Business Degenerating?

According to "Polyphase," it is doing so, but perhaps he is one of those sort of contractors who walk about telling others what to do; if this is so, it is certainly adding to the expense, and in addition he may have a showroom with assistants, a portion of which must surely be added on to his quotations. He certainly overlooks the fact that there are many contractors like myself, who work hard on their own installations and do their booking, &c., in the evenings. I, for instance, can carry out work on new buildings at 10s. 6d. per point in all-British materials (C.J. tubing and Grip fittings) within a radius of twenty miles of London, installation tested and fully guaranteed, and can easily earn 25s. a day; in addition, I usually sell some article or other, which altogether brings in a very handsome income. The days are gone when a contractor sits at home, while others work hard to keep him; why should they?

I find that the contracting business is better to-day than ever it has been before, with plenty of new buildings, and electrical companies opening up in every direction; there is hardly a house built, that does not have electric light, but perhaps "Polyphase" is one of those people who go about paying twopence more per lb. to their tradespeople, &c., and giving their cheeseparing grocer presents? How can he expect the British public to pay a pound for ten shillings' worth of work? He forgets that we are all business people, it is he who is degenerating.

Hard Working Ex-Service Electrical Contractor.

October 9th, 1925.

The Æsthetic Aspect of Advertisements.

I wonder if your correspondent in his travels through Progress Town has ever visited the slums of that city in which so many of us toil.

Here he would find a street which, in the dusk or the fog that mercifully obscures both the palace and the hut, rows of tall, stately houses, he might at first take for the homes of the aristocracy of business—he will indeed read here and there in gold letters, still distinguishable on their grimy window frames such fine old names as John Reactionist, Merchant, Tory Inertia and Tory, The Archaic Manufacturing Company, and a host of others, who in council hall and platform so vigorously opposed the building of Advertising Street.

Let him enter one of the tall mansions, it is also no longer more than a tenement of noisy dens and garrets, candle lit, unappetising, and strangely, although each room is tenanted, there is never a name on the door, and the grim janitor who guides him assures your correspondent that tenants do not live here long—some fatten it is true, bloat, and explode, the victims of a disease to which has been given the name "Integrity in Commerce." Here lurk the long firm, the manufacturer of adulterated foodstuff, all the parasites of business who prey on the good names of their brother traders. There is no rent to pay in Obscurity Street—there are no morals—no rules save one: "Thou shalt not tell."

Progress Town is large, there are many districts; in one your correspondent may find a temple to the Goddess "Truth." Before the temple stands a plain but noble statue erected by the people of the world. It is dedicated curiously enough to the pioneers of Advertising, and perhaps you will permit me to give to the readers of the ELECTRICAL REVIEW the epitaph:—

"These men wrought well, wrought for all, and took just pride in that they wrought. They swore that never would they fail the little world who believed in them, and to this they set their brand and name. That others might have of their service, they risked their all to publish far and wide advertisement of their pledge to which they set their brand. Their names are to-day in every mouth, their memories are happy ones. They were so sure that they wrought well that they told all the world. In Life they gained prosperity, at death they left behind a Good Name, than which there is no greater legacy."

Advertiser.

Liverpool, *October 9th*, 1925.

Electric Wiring.

In your notes in this week's issue you give an extract from *The Dominion* (a New Zealand publication) which goes to prove how things are done "out there."

No country is so lax in framing or carrying out the existing regulations with regard to wiring as Britain, and one wonders just how far our Rip Van Winkle authorities will allow the present state of matters to drift.

The plumber, decorator, &c., have been discussed many times in your "Correspondence" columns, but indeed these individuals seem to be getting more rope than ever, and are even backed up by our law courts. What a contrast! In Australia it has been reported that incompetents are fined for carrying out electrical work, but in this country a law court decision has gone against a certain Corporation for having refused to connect an installation which had been wired by a plumber. Ugh!

I have raised this question with prominent supply company officials, and I am given to understand that anyone is allowed to carry out electrical work, no matter whether they are tailors, bakers, plumbers, &c.

The foregoing facts are (in my opinion) the cause of the scandalously low prices at present ruling in the contracting business. Granted, the incompetent tenderer soon hangs himself—but a new one jumps up, and so the game goes on.

What would happen if I attempted to practise as a doctor, lawyer, &c.? In these professions I contend my knowledge

is equal to that of numerous incompetent persons who are at present practising as full-blown electrical engineers.

Some of your correspondents may be able to suggest a remedy for this unfortunate state of affairs. I admit it is beyond me.

Polyphase.

October 10th, 1925.

Individually Driven Textile Machinery.

You published an article under the above heading in your issue of September 11th on page 410.

A statement is made that with 1,000 h.p. of motor working at full load for 2,200 hours per year and energy at 1d. per unit, the saving is over £60 per annum. This is based upon high-performance machines having 6 per cent. higher efficiency than normal.

We think the amount of £60 is incorrect, and that the actual saving is £456 per annum.

It will be seen from this corrected figure that the extra cost of high-performance machines is more than justified.

Accepting Mr. Haigh's statement that these machines cost 5 per cent. more than ordinary motors, then with an installation of motors costing £5,000, the additional cost is wiped out in a little over six months.

Drake & Gorham, Ltd.

W. Hartley, *Chief Engineer.*

Manchester, *October 8th, 1925.*

[The error was set right by the author in a note which appeared on p. 466 of our issue of September 18th; for £60 read £600, and for 25 per cent. read 240 per cent. The correction, however, could not be given the same prominence as the original article, and in view of its importance we are glad of the opportunity to repeat it.—Eds. Elec. Rev.]

Rural Electricity Supply.

I have to thank Mr. Bartholomew for quoting the case of Mid-Cheshire in his attempt to convict me of "overstatement." Mr. Bartholomew, when quoting from my letter, omitted the essential point which demolishes his charge and puts the boot upon the other foot. Your readers have only to add the words "every paltry interconnecting circuit," which just preceded the part comprising Mr. Bartholomew's quotation and limited my remarks to that class of circuit, intermediate between trunks and subscribers' connections. We have in our scheme to cross several of these circuits; they are not delicately balanced and compensated as is the case with "trunks." They are ordinary simple lines, just a little heavier than subscribers' lines, and they run between Northwich and the neighbouring towns. They are run underground in the towns and suburbs and overhead in the intervening country—the latter purely on account of cost. In more congested areas they run underground all the way. These lines are not, in fact, either long or critical. They consist of half-a-dozen circuits, more or less, to each town, but the Post Office refuses to put them underground. It transpired when I asked "why these circuits could not be put underground," that *the Post Office Rule is to refuse* to put underground any but subscribers' connections, so that, as I stated, the talk of speech efficiency is a mere smoke screen to hide the fact that these lines, or many of them, could be put underground but for the "Rule." It follows logically that Mr. Bartholomew has greatly overstated the consideration given to each case, seeing that all that is done is to sort the crossings into two types—Subscribers' Lines and others. The 23 points where the Post Office offers to put its lines underground in fact include only subscribers' lines, and all of that type to which my statement applied are refused.

Mr. Bartholomew might have the records investigated and state how many town connections or "junctions" the Post Office has offered to put underground for my company and for other undertakings, or if he still states that there are serious difficulties he might write a technical article showing why such interconnection lines cannot be put underground. He should, I suggest, take the Northwich Middlewich and Winsford lines as an example. We cross them twice, and the cost of our doing so underground would be £500 against £50 or so if the Post Office goes underground, so that the expressed anxiety of the Post Office to help has something substantial to actuate it. Mr. Bartholomew can justify his statement in the future by seeing that his assistants give that individual consideration to speech efficiency, &c., in each case—including those in Mid-Cheshire referred to by him—which he, I am sure, *thinks* has been given in the past, but which, in fact, has not been given. By so doing he will earn our gratitude and a great step will have been taken to ease the situation, because the inevitable result will be that many of the "paltry interconnecting lines" will be put underground for us.

Mr. Bartholomew will, I know, forgive those of us who make ourselves a nuisance in order to secure a change of policy. He, as a member of the Post Office staff, knows that this is the only way to secure reform in dealing with a huge organisation bound on all sides by rules—many of them handed down from times when conditions were different. The Post Office staff itself knows that persistent agitation was necessary to secure for itself reasonable treatment from the Government. Our history is one long record of reform wrung from reluctant authorities by means far more forcible than I have advocated.

The Post Office itself is making an attempt to give the rural dweller a telephone service on a specially cheap construction by means of party lines; we hope that the "golden rule" will be carried out by it, and that we shall have the help of the higher officials in securing the removal of obstructions. Personally, having carried out contracts for the Post Office years ago, putting these subscribers' lines underground—and be it noted also town interconnecting lines, such as those we now find in our way in the country districts between towns—I can add my tribute to that of Mr. Borlase Matthews and of yourselves to the personal qualities of sectional engineers. I have none but pleasant recollections of them in the past, and in my present dealings with them. The trouble is that they can do nothing for us—we must get at the higher officials, and we are glad that Mr. Bartholomew has taken notice of the situation.

It is the policy of some companies and local authorities to confine their operations to the towns and to underground work. They say overhead work is too troublesome; the delay is too great and the Post Office too obstructive. In the meantime some of us are energetic enough to stretch out as far as is possible from moment to moment. We have to make ourselves a nuisance to those who block our way by the ramparts of "things as they are," and eventually we get them to move out of our way and allow "Things as they ought to be." Our successors will have the comfort our present discomfort will secure for them, but we will have had the pleasure of pioneering a great movement.

W. Fennell.

Northwich, *October 12th, 1925.*

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1923.

27,545. "Dry cells." R. Baillie and M. A. Adam. March 3rd, 1924. (239,565.)

1924.

9,087. "Windings for electrical regulating apparatus." Scintilla. May 4th, 1923. (215,335.)

9,784. "Electric switches." A. G. Bullem and R. L. Jenkinson. April 17th, 1924. (239,897.)

11,756. "Electric heating devices disposed within an enclosing envelope." Naamlooze Vennootschap Philips Gloeilampenfabrieken. November 22nd, 1923. (225,166.)

12,029. "Indicators for use with wireless receiving and like apparatus." J. Bamford. May 15th, 1924. (239,899.)

12,100. "Dynamo-electric machines." British Lighting & Ignition Co., Ltd., and J. C. Hutton. May 15th, 1924. (239,900.)

12,202. "Incandescent cathodes for electric discharge tubes." Naamlooze Vennootschap Philips Gloeilampenfabrieken. May 18th, 1923. (216,160.)

14,553. "Asynchronous induction motors." V. Martinetto. June 20th, 1923. (217,869.)

14,583. "Electric ignition devices." M. Strelow. June 17th, 1924. (239,921.)

14,632. "Electrical resistances." H. M. Dowsett and H. B. Tilley. June 17th, 1924. (239,926.)

14,647. "Electric radiators." T. H. McQuinn. June 17th, 1924. (239,938.)

14,657. Electric power distribution systems." Igranic Electric Co., Ltd. (Cutler-Hammer Manufacturing Co.). June 17th, 1924. (239,929.)

14,779. "Telephone receivers and the like." W. J. Palmer. June 18th, 1924. (239,935.)

14,856. "Means for supplying current to radio tubes and the like." E. L. W. Byrne (E. G. Gage). June 19th, 1924. (239,939.)

14,869. "Rotors of mercury bath electricity meters." S. Z. de Ferranti and Ferranti, Ltd. June 19th, 1924. (239,940.)

15,022. "Winding of duolateral inductance coils." C. S. Hodson and A. A. Tarbuck. June 21st, 1924. (239,944.)

15,353. "Electrical condensers." H. R. Van Deventer. June 25th, 1923. (218,301.)

15,439. "Electric circuit switches." N. Lemlyn. June 29th, 1923. (218,311.)

15,518. "Push-button control systems for electric motors and other apparatus." Waygood-Otis, Ltd., and E. Clemence. June 27th, 1924. (239,950.)

15,940. "Telephone cables." A. Rosen. July 2nd, 1924. (239,957.)

17,002. "Interrupter devices for electric circuits." British Lighing and Ignition Co., Ltd., and J. C. Hutton. July 15th, 1924. (239,968.)

17,559. "Manufacture of telephone cables." Siemens Bros. & Co., Ltd., and E. P. Elwin. July 22nd, 1924. (239,976.)

17,715. "Electrodeposition of metals." T. W. S. Hutchins. July 24th, 1924. (Cognate application 9,552/25.) (239,977.)

17,900. "Filling of joint boxes for electric cables and apparatus thereof." Callender's Cable & Construction Co., Ltd., and A. E. Wilson. July 26th, 1924. (239,978.)

19,131. "Method of and apparatus for electric welding by means of resistance." D. Sciaky. August 13th, 1923. (220,638.)

22,540. "Electric circuit-breakers." Electrical Improvements, Ltd., and R. W. Gregory. September 24th, 1924. (240 005.)

23,073. "Electrical sub-stations." Metropolitan-Vickers Electrical Co., Ltd. October 1st, 1923. (222,865.)

25,571. "Adjustable electric condensers." Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd.) (L. Edenburg). October 27th, 1924. (240,019.)

25,577. "Electrical structures containing condensers." Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd.) (W. Dubilier) October 27th, 1924. (240,020.)

27,671. "Electric discharge tubes." Naamlooze Vennootschap Philips Gloeilampenfabrieken. November 20th, 1923. (225 218.)

29,336. "Signalling systems." Western Electric Co., Ltd. (Western Electric Co., Inc.). December 6th, 1924. (240.034.)

30,524. "Coating bodies with tungsten electrolytically." Naamlooze Vennootschap Philips Gloeilampenfabrieken. June 29th, 1924. (236,153.)

30,706. "X-ray photography." G. Pearce and Watson & Sons (Electro-medical), Ltd. December 20th, 1924. (240,040.)

30,794. "Electric relays for automatically controlling pressures, temperatures, liquid levels, and for like purposes." Piepmeyer & Co., Kommandit-Ges. April 24th, 1924. (232,917.)

1925.

6,915. "X-ray tubes." Naamlooze Vennootschap Philips Gloeilampenfabrieken. March 27th, 1924. (231,467.)

8,166. "Thermionic valves." W. R. Bullimore. March 20th, 1925. (240,078.)

8,283. "Electric motor starters." Alos Apparatebau Ges. March 27th, 1924. (231,517.)

8,338. "Electrical braking systems for vehicles equipped with more than two electric motors." Forges & Ateliers de Constructions Electriques de Jeumont. April 17th, 1924. (232,575.)

8,587. "X-ray tubes provided with an incandescent cathode and an envelope which consists partly of insulating material and partly of metal." Naamlooze Vennootschap Philips Gloeilampenfabrieken. April 10th, 1924. (232,302.)